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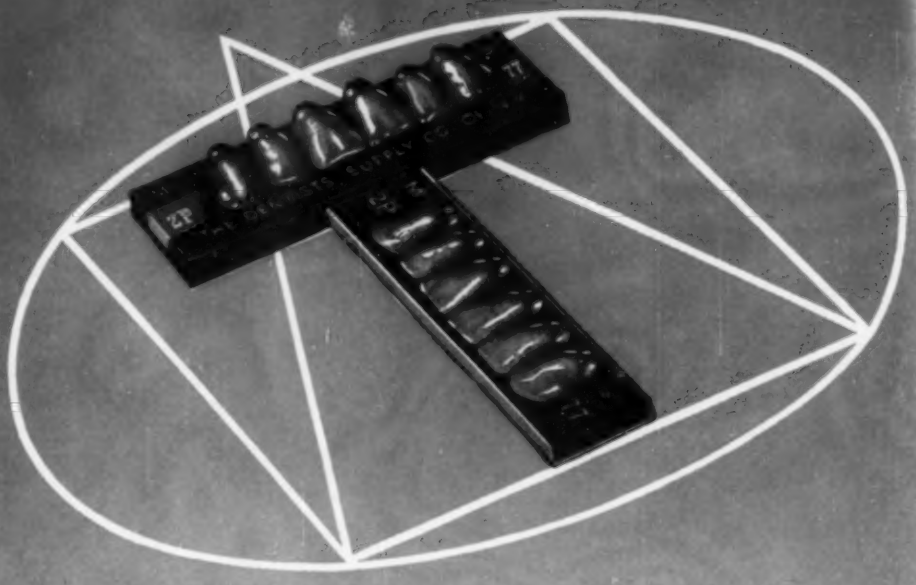

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THE Journal OF THE
AMERICAN DENTAL ASSOCIATION

DECEMBER 1949 • VOLUME 39 • NUMBER 6

NATIONAL LEGISLATION AS IT AFFECTS THE PRACTICE OF DENTISTRY

Lester Callaway Hunt, D.D.S., Washington, D. C.

IN 1935 a compulsory health program for the United States was in the making. Although it had been written into bill form, it was not introduced in Congress for the sole reason that so many new and untried economic measures had been introduced that it was thought best to allow the country time to absorb and become accustomed to certain degrees of regimentation before attempting to pass legislation proposing such a radical change in the nation's health services.

The first compulsory health measure was introduced in 1939. Since that time it has been reintroduced in each session of Congress until over 5,000 pages of testimony have been printed. It should have been no surprise to us when President Truman, on April 22, sent to Congress the bill for compulsory health insurance and a 3,000 word message urging Congress to act favorably on the bill.

You are all familiar with the Hoover Commission report on Reorganization of the Executive Branch of the Government. This report is a splendid analysis of the various federal departments as they now exist, and it made constructive suggestions for reorganization of our federal health services. This report has had a favorable reception throughout the United States and, if all the recommendations are adopted, not only will great economies be attained but a more effective, efficient and coordinated Executive Branch of the Government will result.

In order to accomplish the Hoover report recommendations, Congress passed an act known as the "Reorganization Act," providing a method by which the recommendations could be accomplished. It set out that the reorganization plans submitted to Congress by the President would become law if they were not disapproved by either house within 60 days after they were received.

Eight out of nine reorganization plans submitted by the President have not been disapproved by either branch of Congress and reorganizations are rapidly being ac-

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United States Senator from Wyoming.

complished. However, the President chose to designate "Plan No. 1," a plan for creating a department of welfare, to consist of the Social Security Administration, all educational functions of the Government and all of the health services. The director of the new department was given cabinet status.

It is true that three departments are now, to a degree, under the Social Security Administrator. But at the present time the Commission on Education and the Surgeon General of the Public Health Service have certain administrative authority such as assigning various functions of their work, but under the proposed Department of Welfare, the director, who would be a layman, was given overall authority over health, education and social security.

The Reorganization Act provided for the appointing of a temporary director for 60 days without advice and consent of the Senate and there was no question in anybody's mind that Oscar Ewing, present administrator of Social Security was to be the director of the new Department of Public Welfare. Ewing has been the outstanding and most vociferous champion of compulsory health legislation as well as the outstanding critic of all present health services. He stated that the inadequate health services in the United States were the direct cause of 325,000 deaths last year. Testifying before the committee considering the President's "Reorganization Plan Number 1," he said: "I will not relent in any way my advocacy of the proposed compulsory health program."

With references to disapproving Plan Number 1, the House took no action. However, in the Senate, Senators Fulbright, Taft and myself introduced S. Resolution 147 disapproving the President's Reorganization Plan Number 1. We did this because we knew that in the event Plan Number 1 was not disapproved by Congress, and Mr. Ewing, as director of a department of public welfare, would have at his disposal all avenues of education, health and social security for propaganda purposes in behalf of compulsory health insurance; and also that this was the beginning of the end of the practice of medicine and dentistry in the United States as we have known it throughout the life of our nation.

It was a tough battle, for the administration put all the pressure at its command on the Senate to reject the resolution, even to the unusual and extraordinary extent of addressing an open letter to the Senate requesting them to disapprove the resolution, and having ten of the Democratic party line followers down to the White House on the day we voted and trying to persuade them to oppose it.

The plan suggested by the President was not the recommendation of the Hoover Committee. However, practically everybody who did not make a detailed study of the President's Plan Number 1 and the Hoover reorganization plan with reference to health services, was of the opinion that Reorganization Plan Number 1 was a Hoover recommendation.

To defeat any reorganization plan, a constitutional majority of either the House or the Senate must disapprove, or 49 members of the Senate must disapprove. On the roll-call vote our resolution of disapproval carried by a vote of nearly two to one, or 60 to 32. The intense interest in this vote is manifested by the fact that 92 senators voted and only 4 were absent.

Now, however, the dental and medical professions are faced with the fact that we must prepare and submit to Congress legislation carrying out the recommendation of the Hoover report for a "United Health Services."

The time is most appropriate, for we have just won a great battle. We are carrying the ball, so to speak, and we can blame no one but ourselves if we do not carry through and make a touchdown.

With this in mind I submit, subject to the approval of the A.D.A. and the

A.M.A., certain recommendations, or a plan, for a national health department which, if approved, I will have drafted into bill form and submit to the second session of the 81st Congress when it convenes in January. This suggested legislation for a "National Health Department" will closely follow the recommendations of the Hoover report.

Health activities of the Federal Government are now very extensive and are constantly growing larger due to increased public awareness and congressional interest in coping more adequately with health problems.

A major factor focusing congressional and public attention on health problems was the sudden realization after World War II that our nation had, in the past, paid huge sums to fight destructive wars, but had not given enough attention to ill health, the insidious enemy at home which was damaging and destroying more lives each year than did World War II.

It has been estimated that over 5,000,000 people are disabled either by sickness or other disability in any one-day period. At least half of these are disabled for periods of six months or more. Production losses in man power and dollars as a result of illness are enormous. There can be no doubt that health is one of our most—if not our most—vital resources. This emphasizes the urgent need for recognition of federal health programs in the highest levels of government administration.

The scope of current federal health activities is tremendous and is widely scattered. Four large and approximately 40 smaller agencies of the Government spent about $1-¼ billion for health and medical services in the fiscal year 1948. The largest part of this was spent for medical care of veterans. The United States now gives varying degrees of care to about 24 million people. About one-sixth of the population of the nation, and 350 to 360,000 personnel, are employed, including 40,637 physicians, dentists and nurses: 15,594 physicians or 8.2 per cent of all the physicians in the United States; 3,221 dentists or 4.3 per cent of all the dentists in the United States; 21,822 nurses or 7.8 per cent of all the nurses in the United States are employed by the Government.

It is extremely important that the federal health program be of the highest quality and that it be carried on by the best organization possible. Because of the vital importance of health to the American people, I feel justified in recommending that the majority of the health activities of the Federal Government be combined in a new federal department.

Some have been willing to accept lesser rank for the health activities of the government; namely, the creation of an independent establishment for health: but it is my sincere belief that the human health resources of the country are as important to the people as are those now dealt with in other departments of our government. This fact should be recognized by the early creation of a federal department of health headed by an officer of cabinet rank.

The word "health" is broad and includes medical and dental care, public health practice, nursing, sanitary engineering, research in medical sciences, and many other specialized activities. The use of the word "health" in the title of a new national "Department of Health" is more logical and comprehensive than the use of the word "medical" which, to many people, includes only care provided by physicians to the sick. Health covers the entire state of well-being and the preventive and curative services and research necessary to produce such a state.

The new department should have, among its principal objectives, the following:

1. Improved quality of health service to all federal beneficiaries.

2. Increased use of non-Government

private and university physicians and dentists in providing care for federal beneficiaries.

3. Improved planning and improved operation of federal hospitals, medical and dental care services to insure better integration with civilian hospitals and civilian medical and dental services.

4. Improved coordination of the Government's health care, public health and health research activities.

5. Extension of the scope of research in the diseases of man.

6. Increased public health education.

7. Increased cooperation by units of the National Health Department with voluntary health agencies.

8. Increased cooperation with other agencies of the Government to minimize the effect of medical and dental draft on civilian care, and to conserve scarce man power.

9. Promotion of better dental and medical care for both civilians and military personnel in preparedness for defense.

10. Greater cooperation between military and nonmilitary medical and dental programs of the Government and cooperation in providing freer exchange of personnel between military and nonmilitary services.

11. Better central planning of nonmilitary medical health programs of the Government which will effect savings through increased efficiency.

12. Furnishing the President and members of the Cabinet with information and help regarding vital problems of mental health and mental attitudes with reference to world cooperation for health and peace.

13. Avoidance of all and every kind of politics, interdepartmental as well as partisan.

The new department should be headed by a secretary. Provision should be made for an undersecretary. In addition there should be five bureau directors who should hold rank equivalent to assistant secretaries of departments, *viz.*, one to direct a bureau of medical and hospital care, one to direct a bureau of public health practice, one to direct a bureau of children's health, one to direct a bureau of research, and one to direct a bureau of staff services.

The secretary and undersecretary of health should be appointed by the President with the advice and consent of the Senate. Individuals in the career service of the department as well as individuals outside the Government should be eligible for appointment to these positions, but no person should be appointed who has ever held any office of any nature in a political party organization.

The secretary should be a professional health worker, active in the practice of medicine or dentistry. He should, in addition, have had broad experience and competence in public affairs.

The undersecretary and bureau directors should all be trained and experienced health personnel (in medicine, dentistry, and so forth) except the assistant secretary for staff services whose competence should be in the field of administrative management.

The bureau directors should be chosen from the career employees of the department.

The following health activities and personnel now in various agencies of government should be combined in the new department of health: (1) United States Public Health Service; (2) Canal Zone non-military hospitals; (3) State health grants and other health programs of The Children's Bureau; (4) health functions of the Office of Vocational Rehabilitation; (5) activities dealing with health in the Food and Drug Administration; (6) functions and duties of the Commissioner of Social Security in the field of health studies.

The following health activities should not be transferred to the new department: (1) Health activities of the Bureau of Indian Affairs; (2) hospital and health

activities of the Bureau of Prisons; (3) medical activities of the Tennessee Valley Authority; (4) medical activities of the Atomic Energy Commission; (5) Soldiers Home in Washington; (6) U. S. Naval Home in Philadelphia; (7) other small hospital and health functions incidental to operations of various Government agencies; (8) military hospitals; (9) Veterans Administration hospitals.

In the case of Veterans Administration hospitals and certain military hospitals which the Hoover Commission recommended for inclusion in a new health agency, it is my belief that these recommendations require additional study. I would propose, therefore, that the law provide that the President appoint a nonpartisan commission, composed of public leaders and professional workers. This commission should study the military and Veterans Administration hospital programs, with a view to recommending action on their integration with the hospital program of the department, or their continued separate administration. Within 18 months from the time of appointment, the report should be rendered to Congress.

The secretary of health and the director of the bureau of the budget should study the program and operation of St. Elizabeth's Hospital, with a view to ascertaining what portion of the load at the hospital is properly a responsibility of the District of Columbia and what part is an appropriate responsibility of the Federal Government outside the District of Columbia. At the earliest practicable date, recommendations should be made to cover the ultimate changes necessary in the St. Elizabeth's Hospital program to bring the hospital under the District and to care for federal patients elsewhere in the Department of Health.

The director of the bureau of the budget should study from time to time all nonmilitary medical activities in the Government which are not included initially in the new department and should recommend their inclusion to Congress if this is found to be appropriate.

The employees of the various units combined in the new department should remain in the same employment systems (Civil Service and Commissioned Corps of the United States Public Health Service) until such time as the secretary of health, the director of the bureau of the budget and the commissioners of the Civil Service Commission have studied the personnel needs of the new department and have recommended a new program acceptable to Congress.

The new employment system should provide for a career, nonmilitary service that will be attractive to workers in the health professions. When the new employment system becomes effective, persons holding United States Public Health Service commissions, or employed under Civil Service, should have the option of being shifted to the new system or remaining in the older systems. However, all employees hired after Congress creates the new system should be employed only within its framework.

The Department of Health should recruit and detail health personnel to other agencies of government, for example, the Indian Service, Coast Guard, Bureau of Prisons, and Department of State and others to which the U. S. Public Health Service now details personnel. Heads of other departments than those named should discuss with the secretary of health assignment of personnel to their activities when necessary. Arrangements should be made by the Secretary of National Defense and the secretary of health under which increased detail of personnel between the national military establishment and the Department of Health for training and operations will be carried out.

All departments of Government, except the military, having medical problems, should seek the technical advice of the secretary of health. This should be done to increase the coordination of

health activities in the government.

A twenty-man national advisory health board with rotating membership should be provided in the law in order that the secretary may have the benefit of advice of non-Government experts in technical and public affairs. Provisions should be made for the appointment of advisory committees on various special problems such as cancer, heart disease, dental health, mental health and others. The secretary should make maximum use of advice given him by the various outside advisory groups.

In order to increase cooperation and coordination between the major groups with health and welfare interests in the Government, a special advisory board to the secretary should be created. This should include the chief of the Medical Services Division of the Office of the Secretary of National Defense, the Federal Security Administrator and the Administrator of Veterans affairs, or their designated representatives.

My recommendations are substantially the same as those of the Hoover Commission. I believe that the time has come for the creation of a separate health program at departmental level rather than that of an independent establishment. While the Hoover Commission recommended integration of the bulk of the military and veterans hospital programs in a new independent establishment of Government, I believe this problem is worthy of continued further study in order to give the various agencies and their beneficiaries a chance to be heard before arriving at any final decision which would transfer them to the new department. However, a serious attempt should be made, under the presidential commission proposed above, to arrive at a conclusion in this matter within the eighteen month period.

It may be said that the plan proposed moves more speedily than the Hoover Commission recommended. With reference to the shift of health activities of the Children's Bureau from the Federal Security Administration, it is my firm belief that these activities can be moved when the department is created, provided adequate safeguards are set up to assure continued emphasis on the child and his health. The creation of a "Bureau of Children's Health," with an assistant secretary in charge, is intended to provide that guarantee.

Either in the proposed new Department of Health or as a separate measure, I propose, for the consideration of the A.D.A. and the A.M.A., that the Government, in its already existing veterans insurance department, create a department of health insurance and blanket in one policy medical, surgical, hospital, laboratory, nursing, and dental insurance. This insurance I would propose be made available to all the people on a strictly voluntary basis. Such insurance, should, however, as is the case in fire and automobile insurance, carry a $50 or $100 deductible clause, in order to prevent the offices of physicians, dentists and hospitals from being overrun with patients who have minor conditions that do not call for medical, hospital and dental services.

We cannot preserve the freedom of the practice of dentistry and medicine; we cannot keep dentistry and medicine uncontrolled and unregimented by the Federal Government; we cannot maintain our American free and independent practice in the health services by simply denouncing socialization or by a standpat opposition. We must present a forward-looking, constructive program for our health services in the United States and I stand ready, during my tour of duty in the United States Senate to assist our profession in every possible way at any time you may call upon me.

The allegation has been made that health activities in the Government must remain linked with those of education and social security. It is my firm belief that there is little in common at the operating level between these programs.

As a matter of fact, it is my view that a careful study of the operations of the Federal Security Agency and its various separate health units would reveal that there are few active or necessary day to day working relationships at the technical level between the agency's separate units since each deals with its distinctive problems. I believe, for example, that the Public Health Service has many more important ties with other agencies of the government than with the Federal Security Agency or its other units.

The stinging refusal of the Senate to accept the President's proposal for an integrated welfare department including health service is ample evidence that the Senate and the people wish action more nearly along the lines of the Hoover recommendation. I would alter that action by giving health its proper place in our government as have other governments; namely, the status as a department which it so properly should have.

THE EFFECTS OF ATOMIC RADIATION ON THE ORAL AND PHARYNGEAL MUCOSA

Joseph L. Bernier, D.D.S., M.S., Washington, D.C.

THE DETONATION of the atomic bombs in Japan in 1945 resulted in the release of amounts of energy hitherto unknown, much of it in the form of radiation. Initially, there was a wide range of the electromagnetic spectrum, from the infra-red visible light and ultraviolet to roentgen and gamma rays. Also liberated were neutrons, which are much more effective biologically than gamma rays and which induce secondary radiation of diverse character and duration in substances exposed to them. In addition, radioactive fission products having varying half lives were liberated, which emitted a wide variety of ionizing radiations. The explosions at Hiroshima and Nagasaki were air bursts; therefore, relatively small amounts of fission products remained at the site, as they were widely disseminated through the stratosphere.

Physical Aspects of the Bomb Burst

The initial impression described by most of the survivors was that of an intense magnesium-like light accompanied by an instantaneous wave of heat. After a short interval violent shock waves spread out from the center and flattened in succession most of the structures in their path. The amount of noise heard varied, many survivors reporting merely a thunder-like rumbling. Confusion was heightened by a transitory darkness lasting for some 20 minutes, which was caused by dust swirling in the air. There was terrific destruction of even the most strongly built structures, and occasional ones that

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withstood the blast were completely gutted by fire. Numerous secondary fires started immediately in the flimsy native structures. This combination of collapse, fire, blast and flash destroyed all but a few buildings within a considerable radius of the explosion, and of course destroyed much of the clinical evidence of the more intense radiation effect which might have been available.

The pattern of injuries which resulted ranged from instant death by crushing and fire to delayed radiation sickness evidenced by weakness and lassitude appearing weeks after the explosion. It has been estimated that 80,000 deaths occurred at Hiroshima with an additional 40,000 persons injured. At Nagasaki there were approximately 40,000 killed immediately and 25,000 injured. Perhaps one seventh of the total number escaped both mechanical injuries and burns, but received sublethal doses of gamma radiation sufficient to produce illness within a period of from one to five weeks. The cause of death of the wounded among those who survived for this period was chiefly bacterial infection, which ran rampant because of the blood dyscrasia incident to radiation and because of the absence of antibiotics. There was unusually high incidence, for example, of erysipelas.

The casualties can be roughly divided into several categories: first, those resulting from falling buildings and flying debris; second, those from fatal burns by fire; third, those from fatal burns as a result of the radiant heat flash, and fourth, those who succumbed to the effects of the ionizing radiation. This report is concerned chiefly with patients in the last category.

Radiation Effect

Although a great number of casualties resulted from the lethal doses of ionizing radiation and considerable general observation was made on these patients from within a short time after the explosion to the present (Fig. 1), little information is available on the changes which occurred in the oral regions. Particularly disturbing is the lack of any reference to specific changes in the teeth themselves and to filling or denture material. It might be said that some of these observations could not well have been made immediately following the explosion, inasmuch as changes in dental materials as a result of radiation might not have been evident for some time. However, no attempt has been made to have dental examinations performed since then, so a valuable opportunity for obtaining clinical data has been lost.

Many of the general observations include references to changes in the oral mucosa and in the pharynx. However, these descriptions, both clinical and histologic, are sketchy. According to LeRoy,[1] it is not possible to state precisely the dosage of gamma rays received by any person or group of persons in either city. It is equally difficult to estimate the amount of radiation on the basis of the symptomatology because of the scarcity of information on the effects of total body radiation on human beings. Certain data, however, are available. In general, those patients who received the largest dosage of gamma rays showed early symptoms of fever and diarrhea, which appeared the day of the bombing. A large percentage in this group showed subarachnoid hemorrhages together with extremely abnormal changes in the bone marrow and spleen. In general there was a complete disappearance of normal leukocytes and marrow cells, leaving only the reticulated stroma and framework of these structures. According to Beck and Meissner,[2] the terminal picture was that of extreme exhaustion, with blood

1. LeRoy, G. V., The Medical Sequelae of the Atomic Bomb Explosion. *J.A.M.A.* 134:1143 (Aug. 2) 1947.

2. Beck, J. S. P., and Meissner, W. A., Radiation Effects of the Atomic Bomb Among Natives of Nagasaki, Kyushu. *Am. J. Clin. Path.* 16:586 (Sept.) 1946.

Fig. 1.—A and B. This patient was dressed in sport clothes. Note the protection from gamma rays provided by his cap. He received a slight bilateral keratitis of the eyes. C. Ray burn of back reproducing pattern of clothes. The darker portions of the material have absorbed more heat which has produced linear burns

oozing from the mouth and anus, with extensive petechial hemorrhages of the skin and often some type of internal hemorrhage discovered only at autopsy.

A second group of patients exhibited no changes until between the seventh and thirtieth day after the explosion. The majority of these had received sublethal doses of gamma radiation. The syndrome which appeared during this period was characterized by epilation (Fig. 2, left) and gastrointestinal disturbances, usually accompanied by diarrhea. In addition, purpura, fever, leukopenia and anemia were noted. There was a steplike rise in the temperature during the early days of this period, which terminated in clinical evidence of exhaustion of the hematopoietic system. It was in this second group of patients that the first oral symptoms were seen. These consisted of hemorrhagic gingivitis, usually associated with tonsillitis, pharyngitis and laryngitis (Fig. 2, right). In the more severely affected in this group, the lesions, particularly those of the trachea and female genitalia, became severely necrotic ulcerations. The picture was essentially as in agranulocytic angina, petechia and purpura appearing in the skin of practically all of the patients in this group.

In the third group, a less severe form of radiation injury occurred. These patients showed early epilation with pharyngeal angina, which in the majority of patients did not appear until the third or fifth week after the bombing. The symptoms of fever, gastrointestinal disturbances and prostration were much less severe. The other characteristic phenomena in this group were weakness, malaise and diarrhea. In general, the inflammatory changes in the mouth, gingiva and throat were much less severe and began to appear about the third week, roughly parallel with the rise in temperature, which reached its climax during the fourth week. Gingivitis occurred in about 10 per cent of the survivors and 20 per cent of the dead, beginning as a reddening, and in a few days producing a swollen, severely painful, necrotic, freely bleeding, ulcerative gingivitis. In many instances a pseudomembrane was formed.

In any consideration of effects of ionizing radiation, it is important to distin-

guish between total body radiation, such as was received by many in Hiroshima and Nagasaki, and radiation of a limited field only, as is commonly used in the therapy of tumors. Since approximately 400 roentgen units of moderately penetrating radiation may be fatal to man when delivered to the entire body, it would appear that any single tissue or organ would receive a relatively slight dose in those individuals who survive exposure to this type of radiation. It is, therefore, very doubtful if such a dose as this could cause permanent damage to most tissues or organs. Practically all of the patients examined at appropriate times gave evidence of severe leukopenia. Values as low as 100 white blood cells per cubic millimeter were reported and the majority of the patients receiving lethal doses of ionizing radiation had white blood cell counts below 1,500. Recovery was apparently negligible among patients whose white blood cell count was less than 600 per cubic millimeter. Anemia was present in many of these patients and became progressively more pronounced for a period of from one to two weeks after maximum depletion of leukocytes was noted. The hemorrhagic tendencies increased the anemia, and few of the patients in whom hemorrhage was a prominent feature survived.[3] At the present time studies are being conducted in the Dental Section of the Armed Forces Institute of Pathology on autopsy material

3. Larkin, J. C., The Distribution of Radiation in the Atomic Bombing of Nagasaki. *Am. J. Roentgenol.* 55:525 (May) 1946.

Fig. 2.—Left. Complete epilation with numerous petechiae over scalp. Right. Ulcerative lesions of both lips. Note the epilation

from patients who were casualties at Hiroshima and Nagasaki.

Changes in the Blood

Since many of the features noted in histologic examination were apparently attributable to the changes which occurred in the blood, it is well to review the characteristic blood picture before discussing the histologic changes in detail.

Ionizing radiation, in general, affects secondarily the circulating blood, a sensitive and rather easily evaluated gage of the variety and degree of radiation effect on the blood-forming organs and also of the character and degree of the patient's recovery. In 1903, Heinecke[4] first described the action of roentgen rays on the blood and blood-forming tissues. Subsequent studies attempted to differentiate the effects of various kinds of ionizing radiation, but Warren and co-workers[5] concluded several years ago that when proper corrections for absorption were made, there is no convincing evidence of quantitative and qualitative differences in the reaction to different doses of ionizing radiation within the range of hard and soft roentgen rays, gamma rays and the alpha and beta particles of radium. This, to some extent, makes it possible to apply the information already at hand concerning the effects of hard roentgen rays to the interpretation of the effects of the extremely hard gamma rays liberated by the atomic bomb. However, the effects of total body radiation, about which very little is known, tend to make the interpretation of these data somewhat questionable.

After exposure to injurious amounts of gamma radiation, the leukocytes in the circulating blood undergo a series of changes. First, after a lethal dose, a leukopenia of 1,000 per cubic millimeter or less usually appeared within 24 to 36 hours, becoming progressively more severe, until the white blood cells were reduced to less than 500 per cubic millimeter or disappeared entirely from the circulation. Second, in patients receiving amounts of gamma radiation which approximated the lethal dose minus 50, the white blood cell count declined slowly after exposure, reaching its minimum level during the third and fourth week.

Patients receiving a definitely sublethal dose of gamma radiation exhibited leukopenia, but the average count in the fourth week, at the time of lowest level, ranged between 1,500 and 2,500 white blood cells per cubic millimeter. Differential counts revealed that lymphocytes were reduced in absolute numbers from the time of the first observation to approximately the twelfth week (Figs. 3 and 4). A shift to the left was present early in the course of the disease. Extreme thrombocytopenia was one of the striking characteristics in severely affected patients. Some of the counts in the fatal cases in the third to sixth week were as low as 25,000 and in several of the survivors the count also approximated that figure. The severe hemorrhagic state appearing in the third to the fourth week was manifested by purpura, epistaxis and metrorrhagia. It is not possible to demonstrate a relationship of these symptoms with a degree of thrombocytopenia, because platelet counts were as a rule performed only on patients with demonstrable purpura.

Histopathologic Changes

In general it may be stated that the oral and pharyngeal lesions were probably due to complete elimination of peripheral leukocytes, followed by the entrance of pathogenic organisms to produce ulcerating lesions throughout the entire gastrointestinal tract. It is likely

4. Heinecke, H., Ueber die Einwirkung der Roentgenstrahlen auf Tiere. *Med. Wchnschr.* 1:2090, 1903.

5. Warren, S., and others Effects of Radiation on Normal Tissues. *Arch. Path.* 34:443 (Aug.); 562 (Sept.); 749 (Oct.); 917 (Nov.); 1070 (Dec.) 1942; 35:121 (Jan.); 304 (Feb.) 1943.

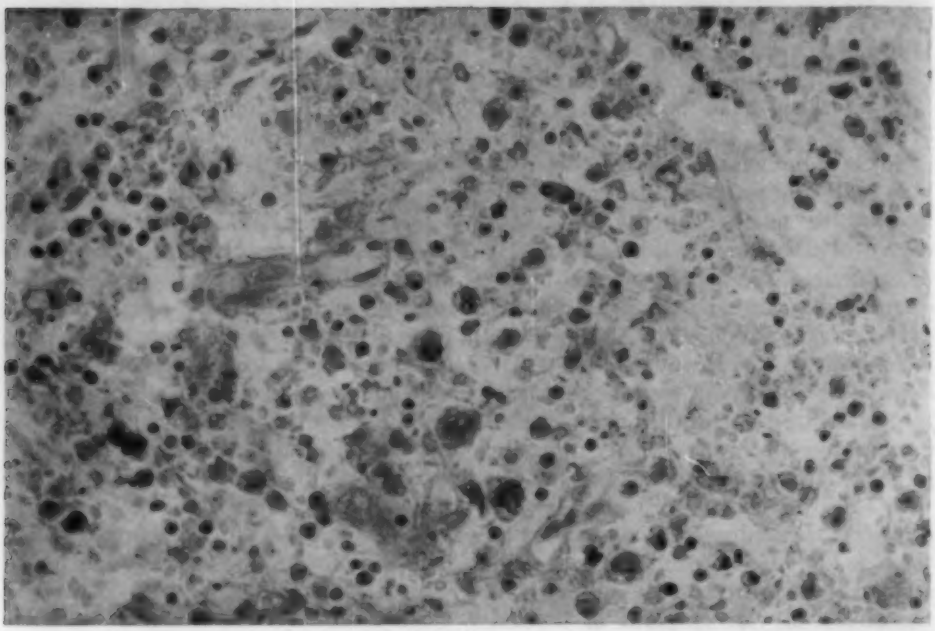

Fig. 3.—A section from a lymph node taken near the edge of a focus of necrosis. Note the large mononuclear cells with folded nuclei. These are probably atypical reticulum cells

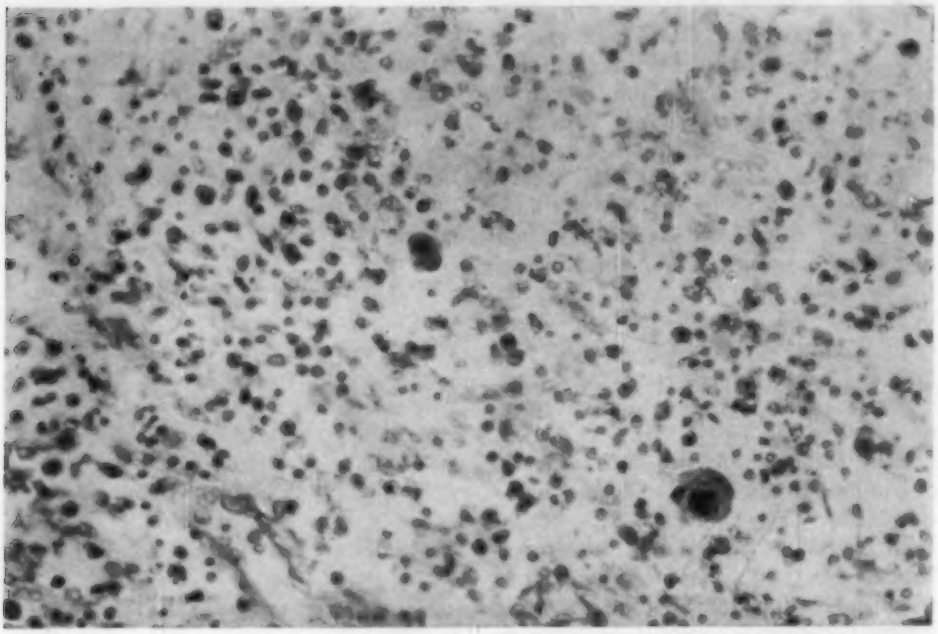

Fig. 4.—Section from a lymph node showing large atypical forms resembling Reed-Sternberg cells

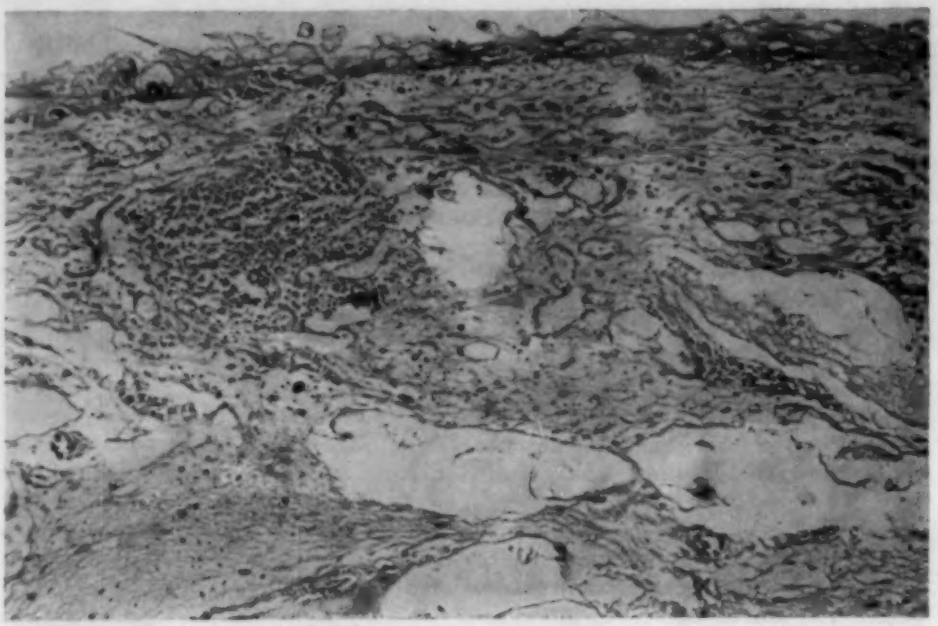

Fig. 5.—A section of pharangeal mucosa. Edema and atrophy of the lymphoid tissue are prominent. Note the extensive lymphectasia

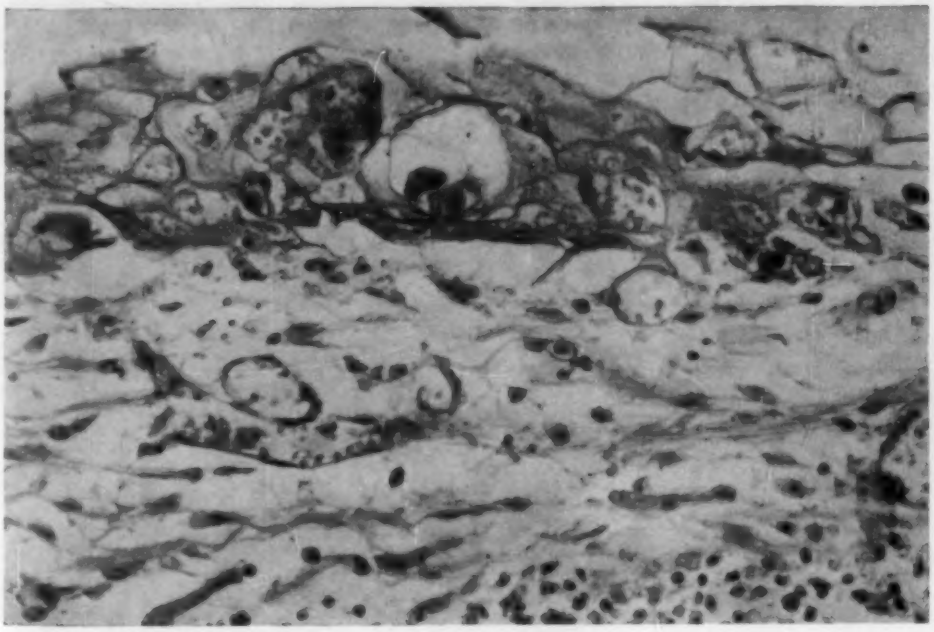

Fig. 6.—Higher power of pharangeal mucosa showing swelling and vacuolation of squamous epithelial cells

that the gingival manifestations represented an exacerbation of existing infection in the periodontium, as a result of the loss of peripheral leukocytes, together with the disturbances in the lymphatic system. In a mouth totally free from gingival and periodontal infection it is possible that these changes would have been less pronounced.

Some of the principal histologic changes occurred in the oral epithelium and were as follows: there was extensive vacuolation of the individual epithelial cells, with noticeable shrinkage of the nuclei (Figs. 5 and 6). This shrinkage was not uniform, with the result that a bizarre configuration was produced. The melanin pigment, normally present to some extent among Japanese, was abnormally distributed, often being found in the cells of the stratum malpighii and stratum granulosum. The mitotic figures, usually demonstrable in the basal layer, were almost completely absent, indicating a cessation of maturation in that tissue. The stratum corneum, in areas where it was well developed, was separated from the underlying stratum granulosum and showed extensive necrotic changes. In the papillary layer of the corium, small mononuclear cells were noted, usually concentrated about the blood vessels.[6] There appeared to be no substantial change in the collagen content of the fibrous connective tissue. In the skin there was atrophy of sebaceous glands which accompanied a similar change in the hair follicles, accounting for the epilation. The sweat glands were more resistant, and within two months there was evidence of clinical and microscopic regeneration of hair characterized by a

6. Ash, J. E., A Pathologist's Report on Hiroshima (lecture), Washington Academy of Medicine, May 19, 1947.

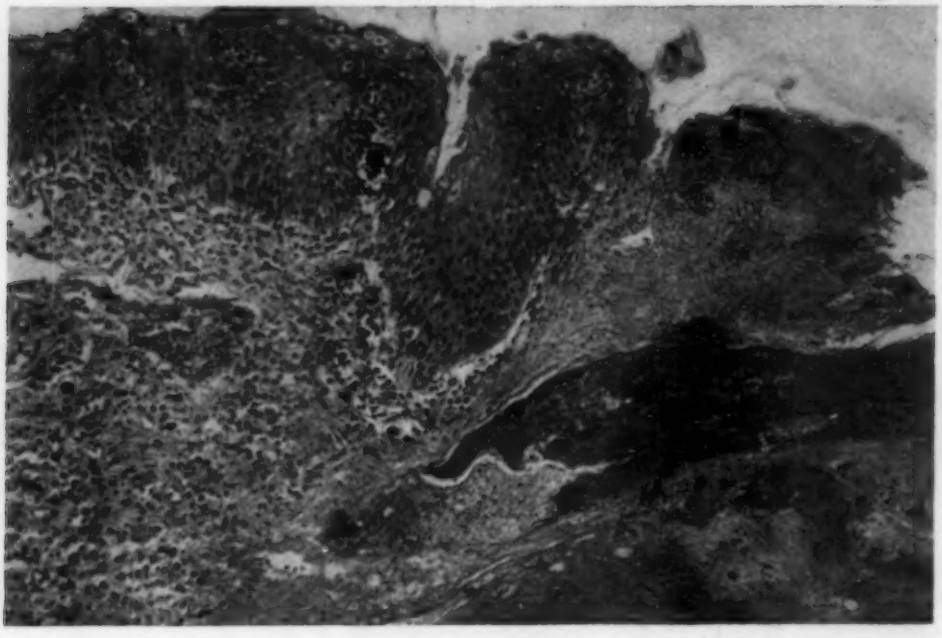

Fig. 7.—Necrosis of tonsil. Note the sharp demarcation between necrotic and viable tissue. No leukocytic barrier is present

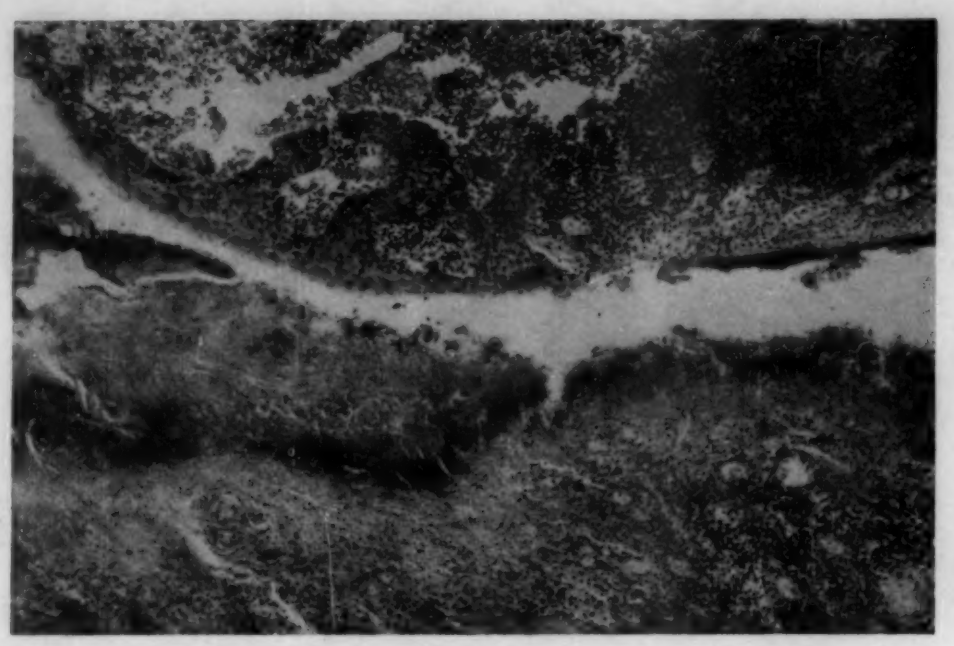

Fig. 8.—A section of tonsil. The crypt epithelium shows accumulation of bacterial masses and necrosis. Note the absence of granular cell zone between necrotic and nonnecrotic zones

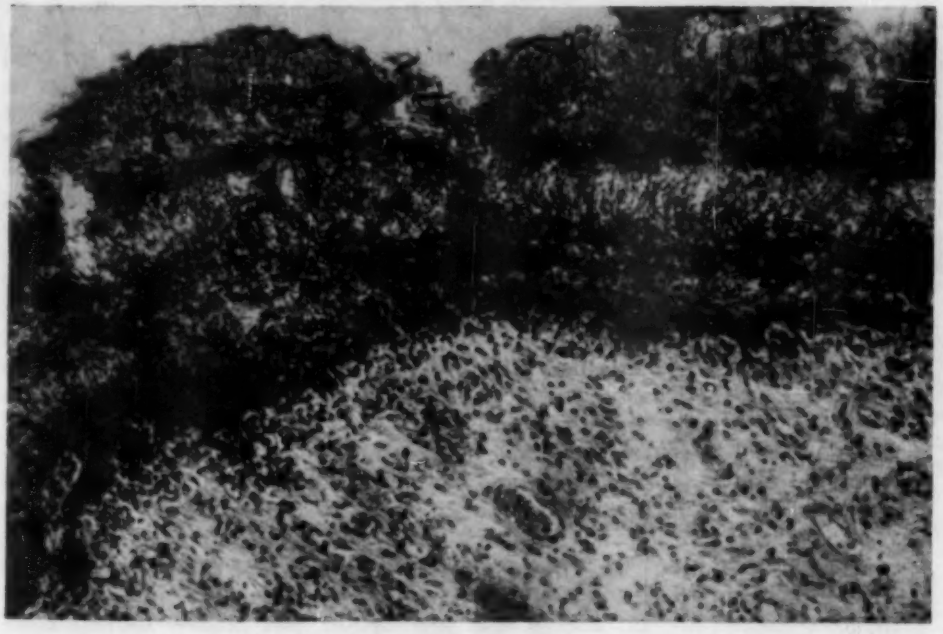

Fig. 9.—A section from the surface of the tonsil. There are large collections of thrush myceliums which are most likely monilia

Fig. 10.—Swelling and vacuolation of epithelium of the tongue. Note the parakeratosis and dilatation of the lymphatics

new zone of differentiation of the internal root sheath at the base of the old follicle.

Sections from the tonsil were most revealing. As a rule, extensive necrosis of the epithelium occurred, being peculiarly distributed. It was not uncommon to find areas of total necrosis changing suddenly to a more normal type of epithelium, showing the vacuolation previously described (Fig. 7). A most pronounced change was the eradication of the lymphoid elements with the appearance of bizarre cell forms. In these areas necrosis was complete, and there was a total absence of any polymorphonuclear leukocytic barrier between the necrotic and nonnecrotic zones. Also noticeable were changes in the crypt epithelium—again necrosis was seen with the lymphoid changes just described. There were no granular leukocytes present (Figs. 8 and 9).

Sections from the tongue showed swelling and vacuolation of some of the cells, although this was not as extensive as on skin surfaces. Some of the cells exhibited considerable atrophy, and nuclei were often hyperchromatic. Parakeratosis was seen in some areas, although this may have existed previously and not have been an effect of the radiation. Much edema was seen in both the epithelium and the underlying tissue, and a mononuclear cell infiltrate was noted, usually aggregated about the blood vessels (Fig. 10). The lymphatic tissue in general showed a remarkable degree of atrophy discernible as early as the third day. Mature leukocytes had almost completely disappeared from the spleen and lymph nodes. Beginning on the fifth day, atypical mononuclear cells, sometimes resembling lymphoblasts, began to appear in both the spleen and nodes. Other mononuclear cells were larger and more bizarre, with a basophilic cytoplasm which

made them indistinguishable from the Reed-Sternberg cells of Hodgkin's disease. In some instances, secondary follicles reappeared within a period of three months.

In patients heavily exposed to ionizing gamma radiation, severe dysentery-like diarrhea began soon after the bombing and persisted until death. Histologically, extremely bizarre cells and atypical mitoses were found in the mucosal epithelium, and necrosis in large patches of mucosa was common. It is important to state that the changes occurring in the oral cavity and pharynx can be likened in their etiologic and histologic features to those which took place in other regions throughout the gastrointestinal tract.

Summary

Although at the bombing of Hiroshima and Nagasaki many casualties were a result of primary flash burns and secondary trauma incident to fires and collapsed buildings, this report is concerned chiefly with the changes observed in patients receiving both lethal and sublethal doses of gamma ionizing radiation.

A very early depletion of the hematopoietic system occurred with resulting anemia, agranulocytosis and thrombocytopenia, the last manifest clinically in a few weeks by the purpuric state, agranulocytosis by pharyngeal angina, gingivitis and severe secondary infections. Epilation became evident in about ten days. Profound and early changes of both squamous and glandular types were noted in the epithelium. Changes in the oral mucosa were observed but appeared to be essentially similar to those seen elsewhere in the gastrointestinal tract, and thus cannot be considered specific oral manifestations. Further studies are necessary and will be conducted on the material at hand; however, those observations must be augmented by analysis of additional material which may become available as the result of continued study of survivors.

▲

Conservation of Lives.—Progress in life conservation has been proceeding at so rapid a pace in our country that the gains achieved are very impressive even if measured from so recent a date as 1940. Well over one quarter of a million lives were saved in 1947 alone because of the improvement in mortality since 1940.

There were 1,445,370 deaths reported in the United States in 1947; had the population experienced the death rates, by sex and age, observed only seven years earlier, the deaths would have totaled 1,712,396. The difference between the expected and the actual number of deaths, namely 267,026, represents the saving in lives in 1947.—*"The Fruits of Life Conservation," Statistical Bulletin, Metropolitan Life Insurance Company, May 1949.*

PULP CAPPING IN CHILDREN'S TEETH

S. N. Rosenstein, D.D.S., New York

SINCE 1942, pulp capping in children's teeth, particularly the deciduous teeth, has aroused considerable interest and study.[1,2] In tooth conservation studies made at the Children's Dental Clinic at Columbia University School of Dental and Oral Surgery from 1931 to 1941,[3] pulp capping proved to be a most effective and valuable procedure as a routine part of a general treatment plan for dentistry for children.

A description and discussion of the general treatment plan followed in the Columbia studies are pertinent in order to emphasize and demonstrate the importance of pulp capping in children's teeth.

While most of the carious teeth in children's mouths may be treated adequately by simple cavity preparation and filling, there are many teeth which require more radical procedures because of extensive destruction and possible pulp involvement. These cases serve as the basis for tooth conservation studies, which are divided into four groups according to diagnosis and treatment indicated depending on the extent of the carious involvement. The classification in each case is determined on excavation of the cavity and evaluation of clinical signs and symptoms presented; that is, depth of the decay, color of the dentin, sensitivity to drilling, history of pain or discomfort.

The group for cavity sterilization comprises a large number of vital teeth, deciduous and permanent, with deep cavities, where complete excavation might have resulted in pulp exposure. In these teeth all the soft decay was removed and the careful excavation of caries was continued until all the carious dentin was removed except a floor of hard caries immediately overlying the pulp. This was done only to avoid exposing the pulp. Where there was normal sensitivity to drilling and normal color to the dentin walls and floor, the area was sterilized before completing cavity preparation and filling.

The second group, for pulp capping, includes a larger number of teeth, mostly deciduous, where, upon complete excavation during cavity preparation, there was actual exposure, either surgical or carious, at the horns of vital pulps as evidenced by sensitivity to touch, slight hemorrhage at the points of exposure and normal color of adjacent dentin wall or floor. In these cases simple pulp capping was performed and the cavities were filled immediately.

The third and fourth groups are much smaller numerically and include deciduous teeth with greater pulp involvement. The third group includes cases in which pulpotomy was performed. In some of these teeth there was vital pulp exposure too large to permit pulp capping. In others the pulpal involvement was more extensive, and in these cases, during excavation of soft decay, it was found that the pulp horn was exposed with absence of hemorrhage and sensitivity to touch. In these teeth further degeneration was suspected and excavation was continued.

Read before the Section on Dentistry for Children and Oral Hygiene, eighty-eighth annual session of the American Dental Association, Boston, August 7, 1947.

Associate professor of dentistry, Columbia University School of Dental and Oral Surgery, New York.

1. Rosenstein, S. N., Pulp Capping in Deciduous Teeth: Report of a Ten Year Study. *J.A.D.A.* 29:1632 (Sept.) 1942.

2. Easlick, K. A., Management of Pulp Exposure in the Mixed Dentition. *J.A.D.A.* 30:179 (Feb.) 1943.

3. Rosenstein, S. N., Tooth Conservation. II—Clinical Studies. *J. New Jersey D. Soc.* 14:17 (Jan.) 1943.

If, after complete excavation, the pulp tissue at the base of the pulp horn was sensitive and hemorrhagic, that tissue and the rest of the pulp were considered vital and a vital pulpotomy was performed. Under local anesthesia, the coronal portion of the pulp was removed, and, after medication, the pulp chamber and cavity were filled.

In the fourth group, deciduous teeth with entirely or almost entirely degenerated pulps, but negative roentgenographically, were given root canal therapy and filled.

The total number of teeth treated in the four groups was 1,232. Of these more than 90 per cent were in the first two groups; more than 50 per cent of all the teeth treated were in the pulp capping group. Less than 10 per cent of the total number of treated teeth were in the third and fourth groups for pulpotomy and root canal therapy. The small number of cases in the third and fourth groups attests to the success and importance of the pulp capping procedure for vital pulp exposure in children's teeth. It also affords a simpler operative procedure which can be completed in one visit, and subjects the child patient to less discomfort, both physically and psychologically, than would be incidental to pulpotomy or pulpectomy.

Clinical Indications for Pulp Capping

The diagnosis of the condition of the tooth and pulp is most important for proper classification and determination of treatment indicated. Usually pulp exposures are detected during the course of routine cavity preparation. Preoperative roentgenograms help in a general way to indicate gross depth of decay and proximity of such deep decay to the pulp; in many cases roentgenograms do not indicate with certainty the presence of a near exposure, actual small exposure, the extent of degeneration where decay has invaded the pulpal region or the vitality of the rest of the pulp tissue. They do not indicate which teeth need pulp capping. This requires a careful and proper evaluation of the clinical signs presented when the pulp exposure is discovered.

Those vital teeth, deciduous and early permanent, with actual pulp exposure and exhibiting (1) sensitivity to touch and (2) slight hemorrhage at the points

Table 1.—Data on deciduous teeth treated by pulp capping

Pulp capping material	Successful	Unsuccessful	Did not return	Totals	Per cent of success	Standard error
Copper cement and regular liquid	106	9	12	127	92.3	2.5
Copper cement and silver nitrate liquid	202	19	60	281	91.4	2.0
Zinc cement and silver nitrate liquid	49	4	12	65	92.5	3.6
Zinc oxide and thymol	24	4	2	30	85.7	6.6
Zinc oxide and eugenol	68	12	26	106	85.0	4.0
Other agents*	14	1	4	19	—	—
Total	463	49	116	628	90.4	1.3

*This group includes five cases treated with silver cement and silver nitrate liquid.

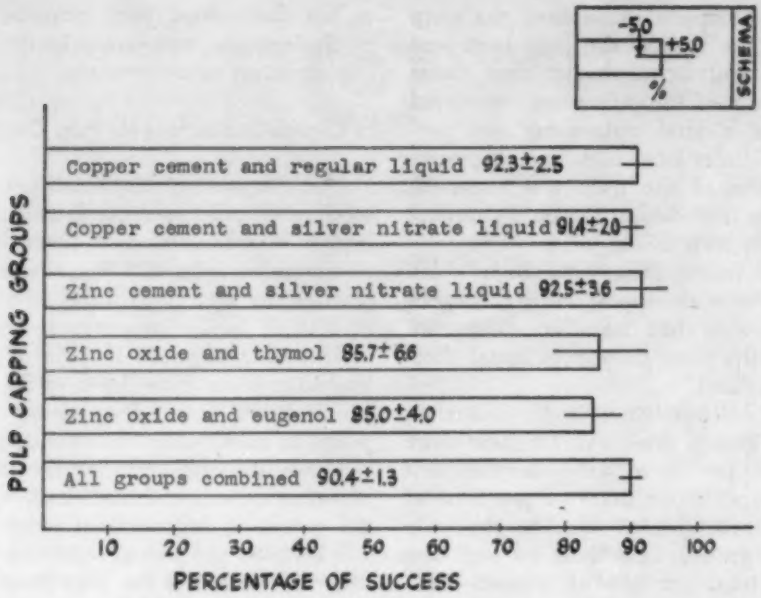
-5.0
+5.0
%
SCHEMA
PULP CAPPING GROUPS
Copper cement and regular liquid 92.3±2.5
Copper cement and silver nitrate liquid 91.4±2.0
Zinc cement and silver nitrate liquid 92.5±3.6
Zinc oxide and thymol 85.7±6.6
Zinc oxide and eugenol 85.0±4.0
All groups combined 90.4±1.3
10 20 30 40 50 60 70 80 90 100
PERCENTAGE OF SUCCESS

Fig. 1.—Percentages of success for five larger groups and for all groups combined

of exposure and (3) normal light color of dentin adjacent to the exposure region, may be judged amenable to pulp capping. A fourth criterion based on the size of the exposure also may be considered.

The first criterion, sensitivity to touch at the point of exposure, is an important factor in judging vitality. The dental explorer, when applied to deciduous tooth dentin, usually will not elicit a painful response; when brought in contact lightly with the vital pulp tissue at the pulp exposure region, it will elicit a definite pain response. The same type of response can be elicited in an exposed early permanent tooth; as additional evidence of vitality, permanent teeth usually will elicit a greater pain response, as they are more sensitive to drilling and exploration.

The second criterion, slight hemorrhage at the point of exposure, is equally important in judging the vitality of the exposed tooth. Usually, on exposure of the pulp in a vital, carious tooth, deciduous or permanent, only slight hemorrhage will be present, with a slight pink color of the tissue. The deep exposure regions of a cavity should be examined frequently and carefully during cavity preparation. Sometimes after an exposure has been made unknowingly, the pulp tissue may recede from the exposure region and the slightly hemorrhagic color disappears. In these cases, the exposure may be overlooked, and if a permanent filling is inserted without benefit of a protective pulp capping or base, pulp degeneration will be inevitable. Excessive hemorrhage may be evidence of an advanced state of pulpitis and may contraindicate pulp capping.

The third criterion, light color of the adjacent dentin, is of less importance than the two factors just discussed, but is helpful in certain cases. In general, the dentin adjacent to the pulp exposure should resemble normal dentin. In teeth

which have been filled previously with amalgam or copper cement, the dentin may be darker than the normal and this should be taken into consideration. Where the brown or tan color of caries is present, this should be excavated to sound, normal appearing dentin. In occasional cases where local anesthesia is used for cavity preparation for a sensitive permanent tooth, there may be an absence or minimum of hemorrhage; the color of the adjacent dentin becomes an important factor in determining the condition of the tooth. When a surface has a rather extensive dull gray color which appears to be underlying the superficial structure, a more advanced pulp involvement and degeneration may be suspected and pulp capping is contraindicated. When the pulp exposure region is surrounded by carious structure and the entire region exhibits a gray color, especially in the absence of sensitivity and hemorrhage at the region of exposure, extensive pulp tissue degeneration should be suspected, and pulp capping is contraindicated here also.

The size of the exposure region is another factor which merits consideration. All other factors being favorable, an exposure on an occlusal aspect of a cavity, or on an axial wall near the occlusal aspect, as large as 1 mm. in diameter may be deemed suitable for pulp capping. At these locations in deciduous teeth, the exposure is likely to be near the ends of

Table 2.—Periods of serviceable retention of deciduous teeth after pulp capping (successful cases)

Half year periods	Zinc oxide and eugenol	Zinc oxide and thymol	Copper cement and special liquid	Zinc cement and special liquid	Copper cement and regular liquid	Other agents*	Totals
½ year	6	1	39	4	28	1	79
1 year	8	5	27	7	13	2	62
1½ years	16	4	42	6	36	6	110
2 years	7	2	27	7	7	3	53
2½ years	11	4	26	6	20	1	68
3 years	4	—	14	3	1	1	23
3½ years	5	2	12	9	1	—	29
4 years	2	—	—	2	—	—	4
4½ years	4	4	6	1	—	—	15
5 years	1	1	3	3	—	—	8
5½ years	3	—	5	—	—	—	8
6 years	—	—	1	—	—	—	1
6½ years	1	—	—	1	—	—	2
7 years	—	1	—	—	—	—	1
Totals	68	24	202	49	106	14	463
Means†	25.6±2.0	27.6±3.7	20.0±1.2	26.8±2.3	14.5±.85		

*"Other agents" includes the small group capped with silver cement and special liquid.
†Mean periods of serviceable retention given in months (with standard error). The mean for the five larger groups combined is 20.8±.74.

Fig. 2.—Pulp capping of lower left second deciduous molar with red copper cement and regular liquid, March 11, 1938, when the patient was 6 years old. Above: View taken June 9, 1938. Below, left: View taken June 5, 1939. Right: View taken June 4, 1940. The tooth was normal and in function. Time of serviceable retention was 27 months

the horns and thus would indicate the absence of extensive pulp horn degeneration. If the exposure is too large and is carious in origin, pulp capping is contraindicated because (1) it is not practicable to place a capping material over so large an area, and (2) it may be a sign of extensive pulp degeneration. Occasionally on the axial wall of a compound cavity in a deciduous tooth, at or near the axiogingival line angle, there may be a relatively long but narrow region of exposed pulp tissue. This type may be of surgical origin or a combination of surgical and carious origin, and in relation to pulpal anatomy would be near the bifurcation of the buccal and lingual pulp horns. In some cases of this type, the exposure regions were 2 to 3 mm. in their buccolingual diameters and about .25 mm. in their cervico-occlusal diameters. Should the region be more extensive, there is a physical obstacle to successful pulp capping making it difficult and not practicable to cover and protect the underlying tissue.

Procedure for Pulp Capping

On discovery of the pulp exposure the tooth should be isolated and a dry operative field maintained by use of small cotton rolls and a small saliva ejector, or a rubber dam. In most cases treated in the study, the former method was used; occasionally the rubber dam was used.

1. Excavate all carious dentin near the region of exposure. This should be done gently and carefully to minimize further trauma to the pulp tissue. The excavation instrument must be sharp; it may be a fairly large round bur (no. 5 or 6 for deciduous teeth; no. 6 or slightly larger for permanent teeth), or a spoon excavator. The dentin wall in the vicinity of the exposure should be hard and sound.
2. Cleanse and dry the cavity.
3. Apply phenol and dry thoroughly. The phenol, either 95 per cent solution or phenol compound, should be applied with a small pellet of cotton and should

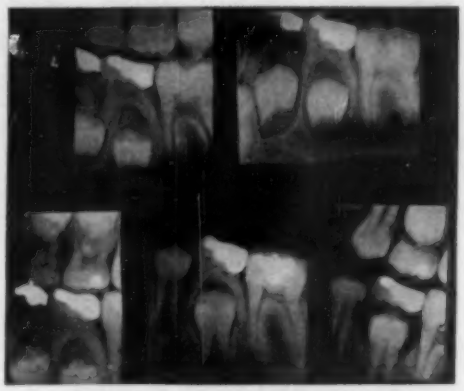

Fig. 3.—Pulp capping of lower left second deciduous molar with red copper cement and silver nitrate liquid, May 9, 1935, when the patient was 5 years old. Above, left: View taken Dec. 30, 1936. Right: View taken Dec. 12, 1937. Below, left to right: Views taken June 15, 1938, June 14, 1940, and Feb. 3, 1941. The time of serviceable retention was 69 months. Resorption occurred close to the crown. The root ends were still present Feb. 3, 1941

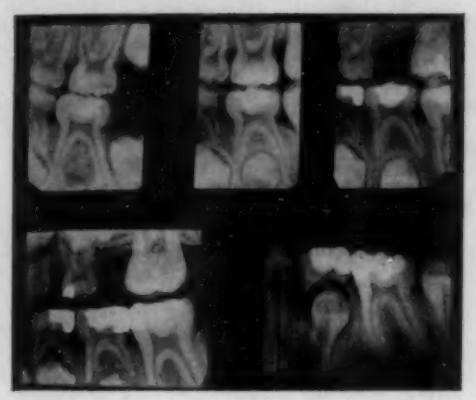

Fig. 4.—Pulp capping of the lower left second deciduous molar with zinc cement and silver nitrate liquid, Feb. 19, 1934, when the patient was 5 years old. Above, left to right: Views taken Feb. 19, 1934, March 20, 1935, and Jan. 27, 1937. Below, left: View taken Feb. 2, 1939. Right: View taken May 31, 1940. The tooth was normal. The time of serviceable retention was 75 months

remain in contact with the exposed region and adjacent dentin for about a minute. It is not to be followed by alcohol. After the excess phenol has been removed with cotton pellets, the cavity should be dried thoroughly by gentle blasts of warm air.

4. Apply the capping material. Several materials were used in the study; red copper cement mixed with regular liquid or silver nitrate saturated liquid, zinc cement and silver cement mixed with silver nitrate saturated cement liquid, zinc oxide and thymol and zinc oxide and eugenol. All gave similarly significant successful results. They are discussed in the order of clinical preference.

a. The pulp capping material of choice among those tested is one of the dental cements. A small amount of cement mixed to a soft consistency, slightly softer than that used for inlay cementation, is applied gently with a small instrument directly to the pulp exposure and gently smoothed over the adjacent dentin to form a protective cover and a cement base in a single operation. It is important to apply the cement lightly to avoid pressure on the pulp tissue. A small quantity on an explorer or small plastic instrument will be sufficient to form the cement base readily while it is still plastic and to harden without further manipulation. Thus, trauma from removal of excess cement is avoided and a permanent filling may be placed immediately.

b. A mixture of zinc oxide and thymol offers some advantage in that it hardens rapidly and has a sedative action. However, it is not formed into a base as readily as cement.

c. Zinc oxide and eugenol paste may be used occasionally. It is mixed to a medium consistency and placed gently to fill the entire cavity. It must be trimmed carefully and checked to clear occlusion; the patient must be advised to avoid pressure on the zinc oxide and eugenol. Usually this material is used when time does not permit the placing of the cement capping and base and permanent filling in the same visit. In these cases, the cement is better as a base to protect the pulp tissue as it hardens more quickly; therefore it may be advisable to use the zinc oxide and eugenol instead of another temporary filling over the cement capping.

5. Complete the cavity preparation and place the permanent filling. The

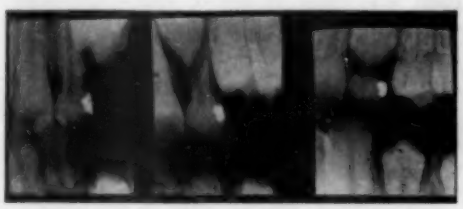

Fig. 5.—Pulp capping of upper left deciduous cuspid with thymol and zinc oxide, March 10, 1936, when the patient was 9 years old. Left to right: Views taken March 10, 1936, Dec. 23, 1937, and June 23, 1938. The tooth is ready to be exfoliated. Time of serviceable retention was 27 months

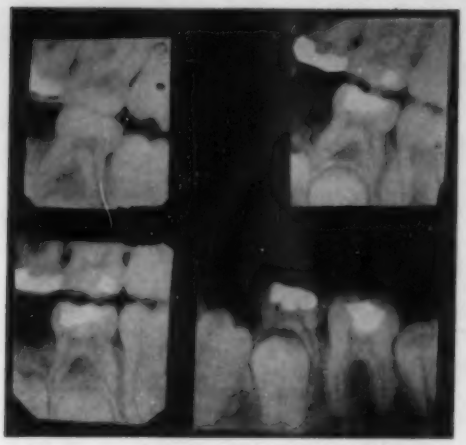

Fig. 6.—Pulp capping of lower left second deciduous molar with zinc oxide and eugenol, March 24, 1933, when the patient was 4 years old. Above, left: View taken Dec. 19, 1934. Right: View taken Nov. 13, 1935. Below, left: View taken June 16, 1936. Right: View taken June 6, 1939. The tooth was normal. The time of serviceable retention was 75 months. (Referred for additional operative work because of new cavity)

cavity must fulfil the requirements for good cavity preparation to prevent subsequent fracture of the filling and loss of the capping. In proximal cavities in deciduous teeth there will be less space available for bulk of material and manipulation than in the permanent teeth. Line angles and retention points must be placed with great care. Silver amalgam was used in all of our cases and was found to be highly satisfactory; gold inlays made by the direct method may also be used.

6. Roentgenograms are an important part of the case record, for comparison and subsequent checking.

Re-examination

During the course of the study all cases were recalled twice yearly for re-examination.

Five tests were used during re-examination and are recommended for checking pulp-capped deciduous and young permanent teeth at regular intervals after pulp capping. These tests are: (1) inquiry as to pain and discomfort since previous visit; (2) testing for tenderness to percussion; (3) careful examination of adjacent gingival tissue and crevice; (4) electric pulp test; (5) roentgen examination. All observations should be recorded on the patients' charts. The cases which respond to these tests favorably are classified as successful; those which respond unfavorably are classified as unsuccessful, even if they have been in the successful category previously.

Results

Deciduous Teeth.—In a previous report complete data on a large group of pulp capped deciduous teeth were published.[1] The more important observations will be reviewed briefly here.

Of a total of 628 pulp exposed deciduous teeth which were treated by pulp capping and observed during a ten year period, 512 returned in response to our recalls for checking (Table 1). Of these 463 or 90.4 per cent ($\pm$1.3) were successful and 49 or 9.6 per cent were unsuccessful.

Several pulp capping agents were used and the percentages of success for the various agents varied slightly. On statistical analysis there was found to be no significant difference among them. All gave results which were statistically comparable and similar (Fig. 1). The group designated as "other agents" was considered too small for statistical evaluation.

The successfully treated teeth were retained in function and service for varying periods of time (Table 2). Up to the end of the study more than two thirds of the teeth had been retained for periods of one to seven years after pulp capping. Almost half had been retained for periods of one and one-half years to

Table 3.—Periods of serviceable retention of deciduous teeth after pulp capping (unsuccessful cases)

Half year periods	Zinc oxide and eugenol	Zinc oxide and thymol	Copper cement and special liquid	Zinc cement and special liquid	Copper cement and regular liquid	Other agents	Totals
½ year	7	1	5	1	4	1	19
1 year	4	2	8	—	4	—	18
1½ years	—	—	2	3	1	—	6
2 years	—	—	—	—	—	—	—
2½ years	1	1	3	—	—	—	5
3 years	—	—	—	—	—	—	—
3½ years	—	—	—	—	—	—	—
4 years	—	—	1	—	—	—	1
Totals	12	4	19	4	9	1	49
Means*	8.0±2.2	13.0±5.0	13.0±2.7	10.5±3.2	6.9±1.5		

*Mean periods of serviceable retention given in months (with standard error). The mean for the five larger groups combined is 10.5± 1.4.

seven years after pulp capping. These teeth continued to function in the children's mouths after the completion of the study, and the serviceable retention periods have grown, although the recorded figures have not been changed. Up to the end of the ten year study, 151 of the 463 successfully pulp-capped de-

Table 4.—Age factor in relation to successful cases of deciduous pulp capping

Approximate age at date of capping	Successful cases	Unsuccessful cases	Ratio of succ.: unsucc. (year groups)	Approximate percentage of success (year groups)
3½ years	4	1	22:4	85
4 years	18	3		
4½ years	13	—	55:17	76
5 years	42	17		
5½ years	22	3	122:14	90
6 years	100	11		
6½ years	28	1	129:7	95
7 years	101	6		
7½ years	15	—	89:4	96
8 years	74	4		
8½ years	9	2	32:2	94
9 years	23	—		
9½ years	3	—	6:–	100
10 years	3	—		

Table 5.—Data on permanent teeth treated by pulp capping

Pulp capping material	Successful	Unsuccessful	Did not return	Totals
Zinc oxide and eugenol	15	3	8	26
Thymol and zinc oxide	7	—	1	8
Silver nitrate cement liquid group				
Copper cement and special liquid	13	1	1	15
Zinc cement and special liquid	2	1	—	3
Silver cement and special liquid	1	—	—	1
Other agents	—	—	4	4
Totals	38	5	14	57
Percentages	88.4	11.6		

ciduous teeth are classified as exfoliated or ready to exfoliate. Of the 151 teeth so classified, 22 are in the zinc oxide and eugenol group, 13 are in the zinc oxide and thymol group and 116 are in the cement groups. It is highly probable that after this time most of the other successfully treated deciduous teeth continued in function until normal exfoliation. Figures 2 to 6 show roentgenograms of cases in each of the five larger groups.

In 49 cases, or 9.6 per cent, of the cases which returned for re-examination during the period of the study there was history of pain or other clinical signs of pulp degeneration at various periods of time after pulp capping. These were classified as unsuccessful (Table 3). In this group, the teeth had continued to function normally and space maintenance was accomplished for various periods of time up to two and one-half years after

Table 6.—Periods of serviceable retention of permanent teeth after pulp capping (successful cases)

1 year periods	Zinc oxide and eugenol	Zinc oxide and thymol	Copper cement and silver nitrate liquid	Zinc cement and silver nitrate liquid	Silver cement and silver nitrate liquid	Totals
1 year	4	1	3	—	—	8
2 years	2	2	1	—	1	6
3 years	—	2	4	—	—	6
4 years	1	2	1	—	—	4
5 years	2	—	2	2	—	6
6 years	3	—	2	—	—	5
7 years	—	—	—	—	—	0
8 years	3	—	—	—	—	3
Totals	15	7	13	2	1	38

treatment. This evidence adds to the worth of the pulp capping procedure.

Pulp capping of deciduous teeth may be done at any age with considerable success (Table 4). The smallest percentage of successful cases occurs with the age group from four and one-half years to five and one-half years. This age group might include part of the period during which the deciduous roots are completely formed. The largest percentages of successful cases are found in the older age groups, when the period of root resorption occurs.

The mean age for the entire pulp capping group is about six and one-half years.

Early Permanent Teeth.—This group of pulp-capped permanent teeth is much smaller, comprising 57 cases. Because of the number, observations have not been subjected to statistical analysis. Since the end of the period of study, additional pulp-capped permanent teeth have been recorded. These will be recalled for re-examination and added to the group now being reported.

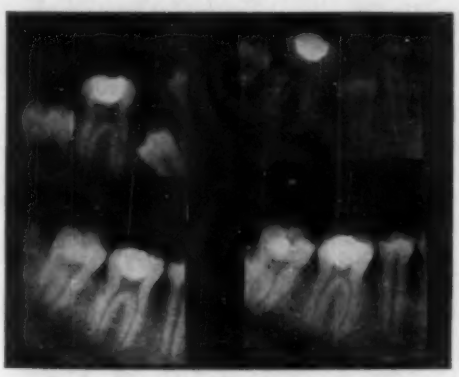

Fig. 7.—Pulp capping of lower right first permanent molar with red copper cement and silver nitrate saturated cement liquid, May 12, 1933, when the patient was 9 years old. Above, left: view taken May 12, 1933. Right: View taken March 27, 1935. Below, left: View taken June 15, 1936. Right: View taken Jan. 11, 1939. The tooth was normal. The time of serviceable retention was 68 months. The tooth continued in function and space maintenance

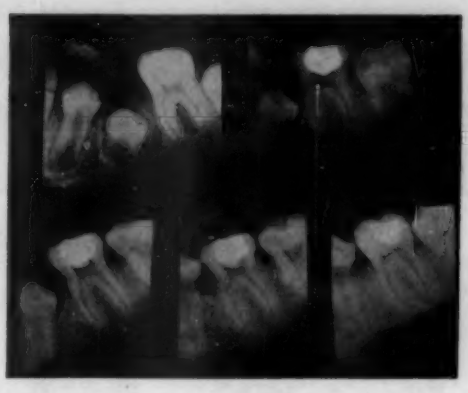

Fig. 8.—Same patient as in Figure 7. Pulp capping of the lower left first permanent molar with red copper cement and silver nitrate saturated cement liquid, May 9, 1933, when the patient was 9 years old. Above, left: View taken May 9, 1933. Right: View taken March 27, 1935. Below, left to right: Views taken Jan. 15, 1936, June 9, 1938, and Jan. 11, 1939. The tooth was normal. The time of serviceable retention was 68 months. The tooth continued in function and space maintenance

Forty-three of the 57 cases returned for reexamination. Of these 38 or approximately 88.4 per cent, were successful; 5 or 11.6 per cent were unsuccessful.

The distribution of the successfully and unsuccessfully treated teeth according to the pulp capping agents used is shown (Table 5).

The length of serviceable retention is shown (Table 6). At the time of the end of the study almost half of the successfully treated teeth had been in function as normal vital teeth for periods of three to seven and two-thirds years after pulp capping (Figs. 7 to 9). It is probable that most of the successfully treated teeth continued to remain in function normally after the end of the period of the study.

In most of these cases, the patients' ages were 7 to 9 years, inclusive, at the time of pulp capping.

Fig. 9.—Pulp capping of lower left first permanent molar with zinc oxide and eugenol, Nov. 14, 1933, when the patient was 9 years old. Above, left: View taken Nov. 14, 1933. Right: View taken Jan. 16, 1935. Below, left to right: Views taken Jan. 30, 1936, Dec. 24, 1937, and June 20, 1938. The tooth was rechecked June 8, 1939. The tooth was normal. The time of serviceable retention was 67 months. The tooth continued in function and space maintenance

Comments and Conclusions

These observations indicate definitely that pulp capping in children's vital pulp-exposed teeth can be undertaken with a high degree of success. Using the procedure discussed here, pulp capping can be done successfully in deciduous teeth in about 90 per cent of cases. It also appears that the choice of pulp capping material is not so important as other factors in diagnosis and treatment common to all the cases. These contentions are supported by statistical analysis of the observations.[4]

The observations also indicate that in permanent teeth pulp capping may be attended by almost as high a percentage of success as in deciduous teeth.

The proper evaluation of the clinical signs at the time of detection of the exposure is important. The dentist must be certain that a condition favorable for pulp capping exists, as evidenced by slight hemorrhage and sensitivity at the point of exposure, normal color of adjacent tooth structure and small or moderate size of the actual exposure region. These factors should be weighed carefully, and consistency in the choice of cases is one of the most important factors leading to greater success and fewer devitalizations.

It must be realized that the clinical diagnosis alone, utilizing only clinical signs, may not determine the exact condition of the pulp. It is therefore possible that a number of cases may have been borderline cases, or just beyond the borderline, with perhaps a beginning tendency to pulp degeneration, which might not have been detectable. After treatment, this tendency may progress either rapidly or gradually. This may be one of the factors partly responsible for the 9.6 per cent of unsuccessful cases.

Another important factor is the exercise of care in operative procedures. Further trauma to the exposed pulp must be avoided; all applications of medicaments and materials must be made gently to avoid pressure. Lack of exercise of such care might jeopardize the success of the operation.

All cases were treated with phenol before application of the pulp capping material. It is felt that the phenol has a beneficial effect in that it coagulates and sterilizes the possibly traumatized vital pulp tissue at the exposure and lessens sensitivity in that region.[5]

Another common factor is the protection of the pulp and prevention of trauma subsequent to pulp capping. This is best accomplished by using one of the pulp capping agents as a base over the pulp exposure region and by placing the permanent filling as soon as possible.

4. The data on deciduous pulp capping in this report were analyzed statistically by Bion R. East, D.D.S., associate dean and professor of dentistry, Faculty of Medicine, Columbia University, New York, and the results were found to be significant.

5. Sollmann, Torald, *Manual of Pharmacology and Its Application to Therapeutics and Toxicology*, ed. 5. Philadelphia: W. B. Saunders Company, 1937, pp. 609-613.

While all of the agents used in the deciduous group give approximately similar results, the cements and the thymol and zinc oxide mixture offer the clinical advantages of (1) ease of application in a soft state and (2) rapid setting after application, forming a hard protecting base over the exposure and adjacent dentin. It is likely that some materials other than those discussed here may give similarly successful results, if they are not irritating and provide adequate protection to the pulp. Further protection is afforded by immediate placing of the permanent filling or as soon after pulp capping as possible. This avoids transmission of trauma by pressure through long use of a temporary filling or in removing it preparatory to insertion of the permanent filling.

The value of pulp capping is enhanced by the observations relating to length of serviceable retention. This factor of proved serviceable retention of pulp-exposed deciduous teeth for appreciable lengths of time is important. In many cases teeth which otherwise might be condemned to premature extraction can be treated successfully and retained throughout their normal periods of service until normal exfoliation occurs. It is an important factor also for the early permanent teeth, especially first molars, with pulp exposures. These also may be retained in service as normal functioning teeth, maintaining the regularity of dental arches, preventing extrusion of opposing teeth and preventing abnormal tilting and drifting of adjacent teeth.

Pulp capping of children's teeth may be done at any age with a large measure of success. As a result of these studies made over a ten year period, pulp capping in children's teeth proved to be highly successful and it is now a routine part of the operative procedure at Columbia University's children's dental clinic. Pulp capping can be done as readily and successfully in private dental offices as in a clinic. Many graduates and several members of the teaching staff are using this procedure routinely in their private practices.

Pulp capping offers a simple and efficient method of treating many vital, pulp-exposed children's teeth, which otherwise might require complicated treatment or extraction.

As a means of reducing the incidence of premature loss of children's teeth and enhancing the value of dentistry for children, pulp capping is an effective aid to all members of the dental profession who include children in their practice.

▲

The Business of Education.—Education does nothing for people. Education helps people to do things for themselves, and if health is a state of complete physical, mental, and social well being, then health education is helping people to live in such ways that their ways of living will contribute to their physical, mental, and social well being.

As an educator, it is a little hard for me to think of education as being good business, but I am convinced that in an honest society, every means of helping people to live better lives is good business. *Dr. Thomas Parran, "Health Education Experts Recommend Intensive Study by Representative Group to Determine Effectiveness of Educational Methods," Industrial Hygiene Newsletter 9:4 (April) 1949.*

THE CONDITION OF THE YOUNG DENTAL PULP AFTER THE APPLICATION OF SODIUM FLUORIDE TO FRESHLY CUT DENTIN

Gordon H. Rovelstad, D.D.S., M.S.D., and
William E. St. John, D.D.S., M.S.D., Chicago

Sodium fluoride is being used extensively as a desensitizing agent for hypersensitive dentin. Its efficacy in this role has been established by research and clinical observation. Lukomsky[1,2] first reported the desensitizing effect on dentin of sodium fluoride by direct application. Hoyt and Bibby,[3] Clement,[4] and Sorrin[5] later reported clinical studies that confirmed this effect. These later observers also found that the reaction took place in a very short time—a matter of three to five minutes.

The mechanism of this desensitization is not fully understood. Several theories have been suggested and were discussed in a preliminary report of this subject by Rovelstad.[6] However, studies reported in the literature by Anderson,[7] Barker,[8] Lefkowitz and Bodecker[9] give evidence of pulpal reactions to the application of sodium fluoride to dentin for periods of time longer than required for desensitization. These studies strongly suggest a lowered pulpal vitality as the probable means of desensitization. With this possibility in mind, it would seem logical that the extent of the reaction resulting from the short periods of time required for desensitization be determined, and the use of sodium fluoride as a desensitizing agent for dentin be established as either intelligent and safe or unwise and unsafe.

The purpose of this study is to determine by histologic technic the pulpal response to the application, for five minutes, of sodium fluoride to freshly cut dentin.

Method of Study

Fifty-one teeth to be extracted for orthodontic reasons were selected for this study. All of the teeth were free from caries and restorations and were from patients ranging in age from 9 to 16 years in whom roentgenographic dental surveys revealed no pathologic abnormality.

Occlusal cavities were prepared, with an attempt to have the size and depth as nearly alike as possible. Care was taken

Submitted for master's thesis at Northwestern University Dental School under the direction of Dr. George W. Teuscher, Professor of Pedodontia.

1. Lukomsky, E. H., A New Dentine Desensitizer. *D. Outlook.* 24:537 (Dec.) 1937.

2. Lukomsky, E. H., Fluorine Therapy for Exposed Dentin and Alveolar Atrophy. *J. D. Res.* 20:649 (Dec.) 1941.

3. Hoyt, W. H., and Bibby, B. G., Use of Sodium Fluoride for Desensitizing Dentin. *J.A.D.A.* 30:1378 (Sept.) 1943.

4. Clement, A. J., Sodium Fluoride Paste as a Desensitizing Agent for Hypersensitive Dentine. *Brit. D. J.* 82:168 (April 18) 1947.

5. Sorrin, S., Sodium Fluoride Method for Desensitizing Erosion Areas. *New York J. Den.* 13:399 (Dec.) 1943.

6. Rovelstad, G. H., The Condition of the Young Dental Pulp After the Application of Sodium Fluoride to Dentin. *Northwest. Univ. Bul.* 48:6 (Nov.) 1947.

7. Anderson, V. G., The Chemistry and Testing of Dental Cements. *Austral. J. Den.* 26:358 (Dec.) 1922.

8. Barker, J. N., Reactions of Pulp to Various Filling Materials and Clinical Procedures. *Austral. J. Den.* 46:226 (Dec.) 1942.

9. Lefkowitz, W., and Bodecker, C. F., Sodium Fluoride: Its Effect on the Dental Pulp. *Ann. Den.* 3:141 (Mar.) 1945.

that as little heat as possible would be caused by the bur (35 inverted cone).

Sodium fluoride was then applied to the dry dentin, for a period of five minutes, in one of the following forms: a saturated solution (approximately 4 per cent), pure sodium fluoride crystals moistened with distilled water, sodium fluoride paste according to the formula suggested by Hoyt and Bibby (1 part glycerin, 1 part kaolin, 1 part sodium fluoride). After the application, the cavity was rinsed well with warm water, dried with cotton, and then sealed with base plate gutta percha until extraction. Care was taken that the gutta percha was not excessively hot when placed in the cavity.

Eleven of the teeth were selected as control studies. In these, cavity preparations were made in a similar manner, but no drug applications were made before the cavities were sealed with gutta percha. In all of the preparations of the teeth, care was taken to prevent saliva from coming in contact with the dentin.

Sensitivity of the dentin was checked after sodium fluoride application and compared to the sensitivity before the application. It was tested by observing the degree of reaction to frictional instrumentation and blasts of cold air.

The teeth were removed at the following time intervals: (1) within one hour after the application of the drug, (2) eighteen hours after the application, (3) one week after the application and (4) at various time intervals ranging from 10 to 80 days after application of the drug. These time intervals were selected arbitrarily in an effort to allow sufficient time for pulpal reactions to be in evidence. Extractions of all teeth were made under nitrous oxide and oxygen anesthesia in order to eliminate the possibility of complication resulting from an injected anesthetic. The root tip portion of the tooth was cut off the crown portion, and the teeth were placed immediately in formalin solution for fixation in preparation for histologic study.

The teeth were allowed to remain in 10 per cent formalin solution for 24 hours after which they were washed with tap water for 24 hours. Decalcification in 5 per cent nitric acid, and subsequent treatment were by the usual methods for staining specimens in hematoxylin and eosin. The imbedding process was prolonged over the usual time, since this was felt to be important for the preservation of the pulp.

Five of the 51 teeth selected for this study were unfit for histologic examination and were therefore eliminated from the total results.

Discussion

When sodium fluoride was applied to the dentin of the teeth in this study, there was an immediate desensitization of that dentin (within five minutes) to blasts of cold air and instrumentation. This is in agreement with the previous works reviewed.[1,2,3,4] There was no pain associated with the application. The cold sensation described by Hoyt and Bibby[2] was not experienced by any of the patients in this study, but then none of these teeth was hypersensitive before treatment.

The nine teeth used as control studies exhibited circulatory changes of the pulpal tissue upon histologic examination. These changes, although slight, varied in degree according to the depth of the cavity preparation.

Figure 1 shows a photomicrograph of a control tooth with very shallow cavity preparation just in contact with the dentin. This is a high power magnification of the pulp tissue and dentin at the base of the prepared cavity, and illustrates a normal pulp with a normal layer of odontoblasts, predentin, layer of Weil, and the cell-rich zone beneath the layer of Weil. The connective tissue of the pulp is also of normal vascularity and cellular content. It is a variation from this classic

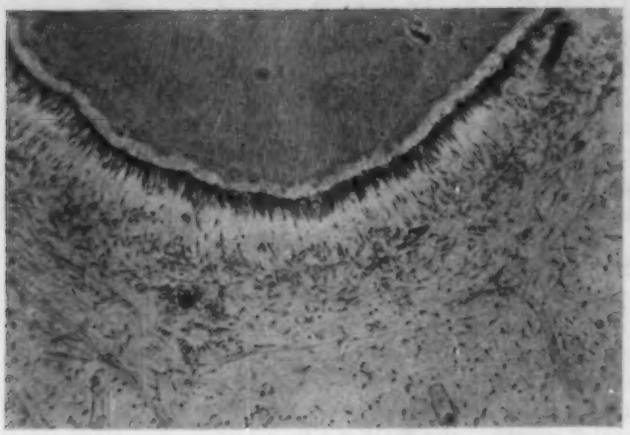

Fig. 1.—Upper first bicuspid tooth (Specimen I1) of patient 12 years of age. This was a control tooth with a shallow cavity preparation. The photomicrograph is a high power magnification of the odontoblastic layer next to the dentin involved in the cavity preparation, illustrating a normal dentin, predentin, odontoblastic layer, layer of Weil, cell-rich zone, and connective tissue of pulp (×225, reduced to about ×125)

picture of a normal pulp from which the following opinions are drawn.

Figure 2 shows another control tooth with a cavity deep in dentin. (This was the only lateral incisor used in the study.) It illustrates the pulpal changes that occurred adjacent to a deep, prepared cavity. There is a pulling away of the odontoblasts adjacent to the prepared cavity as well as an increased vascularity of the cellular area beneath the layer of Weil.

Figure 3 illustrates a control tooth with a cavity prepared to medium depth. This shows the possibility of an inflammatory reaction of the pulp tissue adjacent to the dentin involved in the cavity preparation, since there is definite leukocytic infiltration in this area.

Table 1 is a summary of the reactions occurring in the control specimens. Although there are insufficient numbers to give a significant evaluation, by percentage, of the frequency of occurrence of these conditions, there is sufficient evidence to show that the pulpal tissue manifests a definite reaction to the irritation of the cutting of dentin tubules,

Fig. 2.—Upper lateral incisor tooth (Specimen H1) of patient 11 years of age. This was a control tooth with a deep cavity preparation. The pulp is hyperemic with local areas of hemorrhage and change in the predentin layer (×116, reduced to about ×61)

Fig. 3.—This specimen (2V) is a control tooth, into which a cavity of medium depth was prepared and the tooth extracted 21 days later. No sodium fluoride was used. The histologic picture is normal except for a small area of inflammation and slight hyperemia in the pulp tissue beneath the cavity (×65, reduced to about ×36)

and that the reaction varies in severity in direct relationship to the depth of the cutting. These reactions are mainly circulatory reactions: hyperemia, hemorrhage, cellular infiltration, and some reaction of the odontoblasts. The latter was in the form of a possible increase in the width of the predentin, or at least an increase in the distance from the dentin to the odontoblastic layer next to the cut dentin tubules. However, there is no apparent break in the regularity of the odontoblasts in this reaction.

With these facts in mind, the reactions associated with the application of sodium fluoride must be considered as they compare to the control teeth. Points of difference must be carefully analyzed in order not to confuse the reaction from the cutting of the dentin with that from the application of sodium fluoride.

One of the mildest reactions illustrating a difference from the controls was a pulling away of the odontoblastic layer next to the dentin tubules involved in the cavity preparation (Fig. 4). In addition, however, there is a definite loss of the regularity of the odontoblasts with a scat-

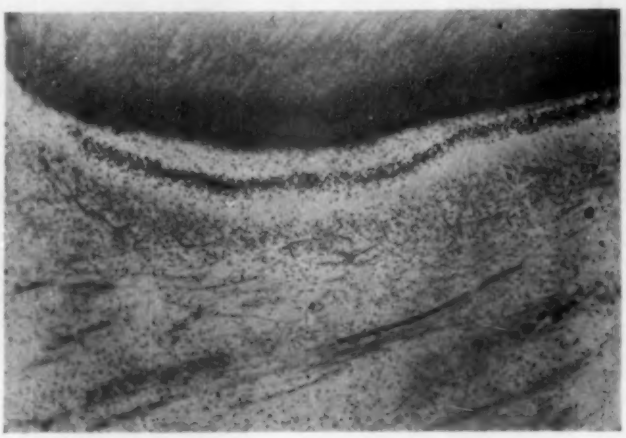

Fig. 4. — Lower bicuspid tooth (Specimen A2) of patient 15 years of age. This tooth was extracted eighteen hours after treatment for five minutes with the paste mixture of sodium fluoride. There is distinct change in the odontoblastic layer approximating the involved dentin (×120, reduced to about ×63)

TABLES OF RESULTS

These tables of results present in detail the experimental data concerning each specimen. Each patient was numbered at the beginning of the work and is represented by this number in column 1. The age of the patient and the tooth number are given. Cavity depth is classified according to the depth of the cavity in dentin. Thus, shallow (S), less than one third of the distance from the dento-enamel junction to the pulp; medium (M), about one half of the distance; and deep (D), two thirds or more of the distance. The period of time between the application of sodium fluoride and extraction of the tooth is found in the column labeled "Days before extraction." Those marked "Immed." were extracted within one hour after application of sodium fluoride. The form of sodium fluoride used in the application is also shown. Control specimens, of course, were not treated with sodium fluoride.

1. Histopathologic conditions in control (untreated) specimens

Patient	Age	Tooth	Specimen No.	Cavity depth	Days before extraction	Form of sodium fluoride	Hyperemia	Hemorrhage		Inflammation	Vacuolization		Thickening of predentin	Secondary dentin	Pulp calcification	Space in pulp tissue
								Pulp	Local		of dentoplastic layer	of pulp tissue				
3	13	R4	G1	M	Immed.	—	x	x								
5	11	RD	L2	M	1	—	x	x	x							
2	11	LD	C2	S	7	—	x	x								
4	13	L4	I1	S	7	—		x								
8	12	R2	H1	D	7	—	x	x	x				x			
15	12	R4	2V	M	21	—				x						
15	12	RD	2W	D	21	—	x	x	x	x						
15	12	L4	2X	M	21	—	x	x		x						
15	12	LD	2Y	M	21	—	x	x		x						

2. Histopathologic conditions in fluoride treated teeth

3	13	RD	G2	M	Immed.	4%	x	x			x					
4	13	R4	E1	M	Immed.	Paste	x	x			x	x				
4	13	RD	E2	S	Immed.	Paste	x	x			x					
6	14	L4	F1	D	Immed.	100%	x	x			x					
6	14	R4	F2	M	Immed.	100%	x				x					
7	14	R4	K1	M	Immed.	100%	x	x	x	x			x			
1	16	R4	A1	M	1	100%	x	x	x		x		x			
1	16	RD	A2	D	1	Paste	x	x			x		x			

Histopathologic conditions in fluoride treated teeth—continued

Patient	Age	Tooth	Specimen No.	Cavity depth	Days before extraction	Form of sodium fluoride	Hyperemia	Hemorrhage		Inflammation	Vacuolization		Thickening of predentin	Secondary dentin	Pulp calcification	Space in pulp tissue
								Pulp	Local		of dentoplastic layer	of pulp tissue				
2	11	R4	B1	M	1	4%	x	x	x	x	x					
2	11	RD	B2	S	1	Paste	x	x	x	x	x					
5	11	R4	L1	D	1	4%	x	x	x	x	x	x				
1	16	L4	D1	M	7	4%	x	x	x		x					
2	11	L4	C1	S	7	100%	x	x	x							
3	13	L4	J1	D	7	Paste	x	x	x		x					
3	13	LD	J2	S	7	100%	x	x	x		x					
4	13	LD	I2	M	7	4%	x	x	x	x	x		x			
5	11	L4	M1	M	7	100%	x	x	x		x					
5	11	LD	M2	M	7	Paste	x	x	x		x					
7	14	L4	K2	M	7	Paste	x	x	x	x	x					
8	14	R4	2A	S	10	100%	x	x		x	x	x				
8	14	RD	2B	S	10	100%	x	x		x	x	x				x
8	14	L4	2I	M	20	100%	x	x	x	x	x					
8	14	LD	2J	D	20	100%	x	x	x	x	x	x				
9	10	R4	2C	S	32	100%	x			x			x			x
9	10	RD	2D	S	32	100%	x			x		x				x
10	14	R4	2E	S	41	100%				x			x			
11	13	L4	2K	D	45	100%	x	x	x	x	x	x				
12	10	L4	2M	S	49	100%		x					x			
9	10	L4	2N	M	55	100%	x	x	x	x						
9	10	LD	2O	M	55	100%										
13	14	R4	2G	D	60	100%			x							
13	14	L4	2H	M	60	100%			x							x
11	13	R4	2P	M	66	100%	x			x						
11	13	RD	2Q	S	66	100%								x	x	
14	12	R4	2U	M	80	100%				x			x	x		x
14	12	RD	2S	S	80	100%					x	x			x	
14	12	L4	2T	M	80	100%				x	x				x	

Fig. 5.—Into this upper bicuspid (Specimen 21) a medium-deep cavity was prepared and sodium fluoride applied for a period of five minutes. The tooth was extracted 20 days later. The odontoblastic layer and layer of Weil adjacent to the tubules involved in the cavity preparation are ill-defined. There is evidence of hemorrhage in this portion of the odontoblastic layer and pulp tissue (×110, reduced to about ×56)

tered appearance of these cells and a lack of definition in the area between the odontoblasts and dentin.

The circulatory reactions of the treated teeth seemed to differ only in degree from those of the controls. That is, the conditions of hyperemia, hemorrhage, and inflammation were more definite and more severe than in the control teeth. Figure 5 illustrates a definite hyperemia and hemorrhage in the local area associated with the treated dentin, as well as a loss of regularity of the odontoblasts and vacuolization. Figure 6 shows a large area of hemorrhage in a similar location. However, here the odontoblasts seem to have maintained their regularity and there is thickening of the dentinoid tissue which is not seen in Figure 5.

The inflammatory reaction illustrated in Figure 7 is definitely related to the treated dentin and is locally severe: but here again, as in Figure 5, there is loss of regularity of the odontoblastic layer associated with the vacuolar appearance of the tissue adjacent to the odontoblastic

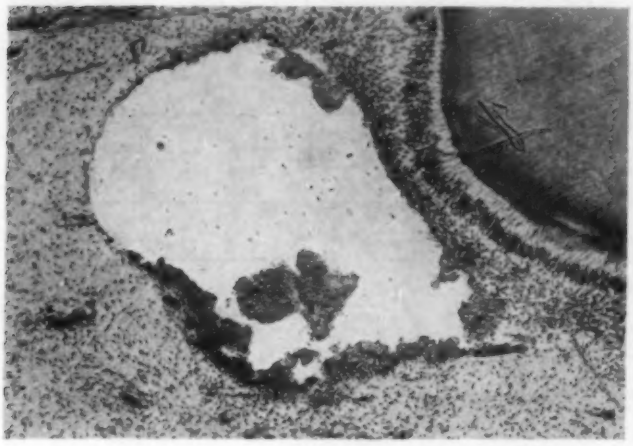

Fig. 6.—A shallow cavity was prepared into this upper bicuspid tooth (Specimen 2M) and sodium fluoride applied for five minutes to the dentin. The tooth was extracted 49 days later. The odontoblastic layer appears normal in arrangement. There is evidently a normal layer of Weil. The dentinoid tissue in the area of the cavity is slightly thicker than in the other parts of the section. In the pulp tissue beneath the cavity is a large area of hemorrhage (×110, reduced to about ×56)

layer. A severe inflammatory reaction associated with a space in the pulpal tissue, loss of definition of the odontoblastic layer and a vacuolar appearance of the pulp tissue, is illustrated in Figure 8. The latter condition suggests a reticular atrophy of the pulp as described by Hopewell-Smith.[10] The space illustrated is similar to that which occurred in five of the treated teeth and resembles neither a pulpal abscess nor a tissue tear of preparation. The sizes and shapes of these spaces were not consistent, but their location was related to the cavity preparation.

The causes of this condition cannot be ascertained definitely. However, it is significant to note its association with inflammation in most cases where it appeared. The possibility of a tissue tear cannot be ruled out completely. In some instances it may be due to the presence of calcifications in the pulp tissue that were dislodged during the sectioning of the teeth.

The formation of secondary dentin was not evident in any of the cases in this study, although a slight thickening of the predentin could be seen in three of the fluoride-treated specimens (Fig. 9).

Calcification in the pulp tissue was seen in three of the treated teeth. In one instance the denticles were associated with an otherwise normal appearing pulp. Advanced degeneration, in the form of widespread vacuolization of the odontoblastic layer and pulp, accom-

10. Hopewell-Smith, A., *Normal and Pathological Histology of the Mouth*, ed. 2. Philadelphia, Blakiston's Son & Co., 1918, Vol. II, Chaps. V, VI, VII, VIII.

Fig. 7.—Section of an upper bicuspid (Specimen 2A) with a shallow cavity preparation. Sodium fluoride was applied and left for five minutes and the tooth extracted 10 days after treatment. In the pulp tissue and odontoblastic layer adjacent to the dentin involved in the cavity preparation is a distinct area of inflammation with infiltration of leukocytes. The odontoblastic layer in this area has lost its identity as an organized arrangement of cells. Vacuolization of the pulp tissue and odontoblastic layer in this area is evident. Hemorrhage can be seen in the root portion of the pulp. There is general hyperemia of the tissue (×55, reduced to about ×42)

Fig. 8.—Section of a lower bicuspid tooth (Specimen 2D) into which a shallow cavity was prepared and sodium fluoride applied for five minutes. The tooth was extracted 32 days after treatment. In the pulp tissue adjacent to the tubules involved in the cavity preparation, a vacant space of oblong shape resides. Around it, and apical to it, is an area of inflammation with leukocytic infiltration. Buccal to this area is a small area in which vacuoles appear and suggest so-called reticular atrophy. Hyperemia is noticed in the area. The dentin adjacent to the pulp in the area of the cavity is stained heavily. There is one small area where the dentinoid tissue is seen to be stained pink. The odontoblastic layer is definable, but not clearly so, and is very close to the dentin. Also, the layer of Weil is vaguely distinguished (×55, reduced to about ×42)

panied the calcifications in the other two teeth.

The most severe reaction occurring in the treated teeth, which more nearly represents pulp degeneration in an early stage than any preceding condition described, is that of the appearance of vacuoles in the odontoblastic layer and pulpal tissue. Figure 10 illustrates what appears to be a vacuolization of the predentin, odontoblastic layers, and layer of Weil. This type of reaction was not evident in any of the control teeth.

Figure 11 shows a more severe manifestation of this vacuolization accompanied by a generalized reaction of the pulpal tissue near the treated dentin.

Figure 12 illustrates the most severe reaction evident in this study. In addition to the infiltration of leukocytes adjacent to the treated dentin and the presence of several denticles in the pulpal tissue, there is a severe vacuolization of the odontoblastic layer. This condition resembles very closely the "sheaving" described by Hopewell-Smith[10] as an advanced stage of pulpal degeneration.

In Table 2 are summarized the results found after examination of the fluoride treated teeth, the frequency of occurrence of the various conditions described above, and their classification according to the period of time between treatment and extraction.

Pathologic change in pulpal tissue appears in various stages of severity. For this reason it is difficult, if not impossible, to observe any given condition in a prepared section and to predict what course it would have followed if the tooth had been left in the mouth.

Clinically, we know that many pulps respond favorably and remain vital for years after being subjected to severe irritation and operative procedures. Yet in this study, pathologic condition of the pulp, in association with a cavity preparation and a five-minute application of sodium fluoride, was evident in practically all cases.

Fig. 9.—A shallow cavity was prepared in this upper bicuspid (Specimen 2E). The tooth was extracted 41 days after application of sodium fluoride. Beneath the cavity, adjacent to the dentinal tubules that comprise approximately the middle third of the cavity, is an area in which the dentinoid tissue is slightly thickened. The odontoblastic layer appears normal. The remainder of the pulp tissue appears normal (×80, reduced to about ×43)

In considering the significance of these pathologic conditions, it is important to understand the nature of a degenerative process. Inflammation in tissue will become more severe, remain static, or be overcome by processes of nature. Certain extrinsic factors may play a role in determining which course the pathologic change may take. It is possible that sodium fluoride may act in this capacity. Will a severe pathologic condition eventuate from its action on the pulp?

From the results of this work, it is not possible to say which course the inflammation observed in these cases will follow. In all probability the control teeth, in which only cavities were prepared, will recover and remain vital, since numerous restored teeth have remained vital and functioning many years after preparation of a cavity and placement of a filling material.

The inflammation after fluoride treatment was more severe in all instances than in the control set. It is known that severe inflammation can result in advanced pathologic changes of the pulp. However, it cannot be concluded that

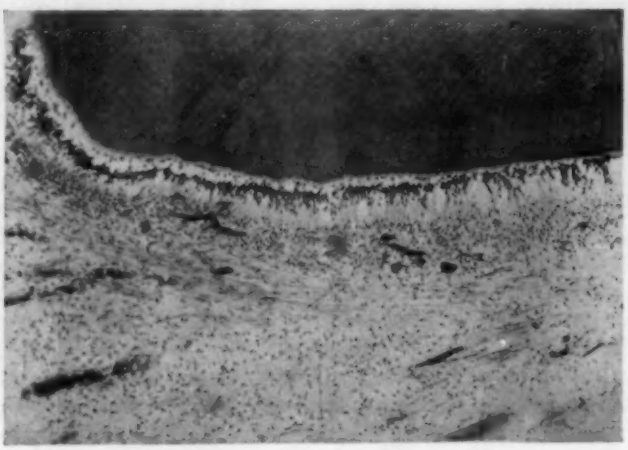

Fig. 10.—Upper first bicuspid tooth (Specimen A1) of patient 15 years of age. This tooth was treated with sodium fluoride crystals and was extracted 18 hours later. There is an apparent vacuolization of the odontoblastic layer as well as in the predentin and layer of Weil (×115, reduced to about ×62)

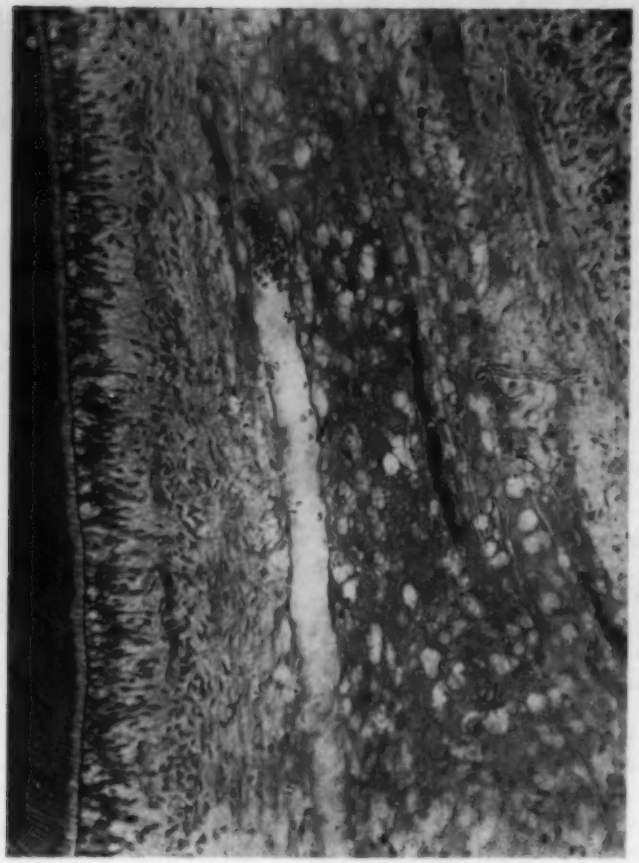

Fig. 11.—Upper bicuspid tooth (Specimen L1) of patient 10 years of age. This tooth was treated with a saturated (4 per cent) solution of sodium fluoride in distilled water and was extracted 18 hours later. The pulp is hyperemic with a definite change in the odontoblastic layer. This high power magnification shows the detail of the vacuolization of the pulp tissue and the odontoblastic layer (×225, reduced to about ×173)

such would have been the case if these teeth had been allowed to remain in the mouth, nor can it be said that processes of nature would have overcome the inflammation and the teeth remained vital.

Therefore, certain facts become evident. Pulp tissue will manifest changes of a degenerative nature whenever dentin is involved by a cavity preparation, or by a cavity preparation and a five-minute application of sodium fluoride. In all instances the more severe pathologic condition is associated with a five-minute application of fluoride to dentin. As the time interval between treatment with fluoride and extraction increased, so did the severity of the pathologic condition of the pulp tissue.

Conclusions and Practical Applications

Although much work remains to be done in the study of the pulp conditions associated with application of sodium fluoride to dentin, it is clear that there is an effect upon the dental pulp. This raises several questions of practical significance: (1) What is the eventual outcome of these reactions? (2) Should sodium fluoride be condemned as a desensitizing agent? (3) Is there a possibility that topical application of sodium

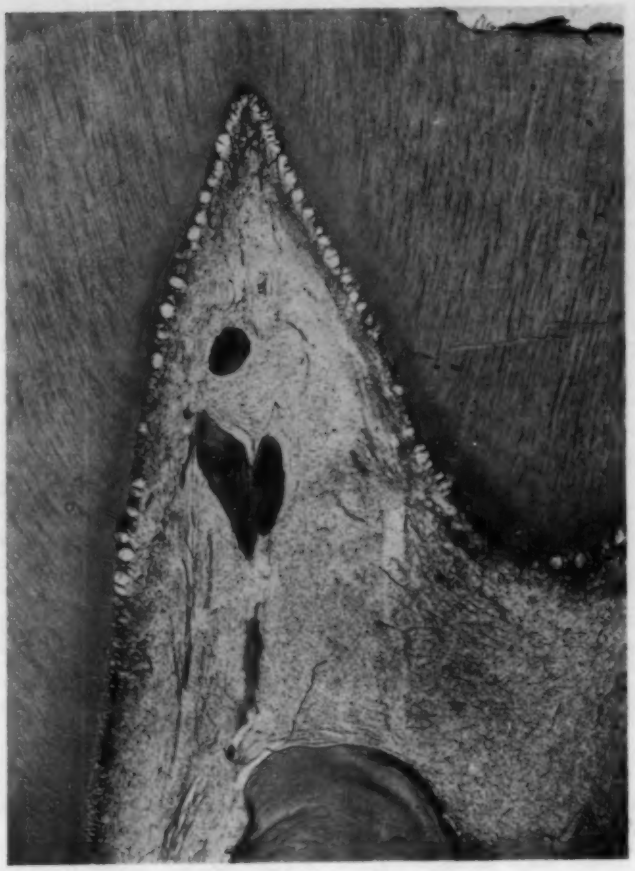

Fig. 12.—This lower bicuspid (Specimen 2T) was extracted 80 days after application of sodium fluoride for five minutes to the dentin of a shallow cavity. The odontoblastic layer in the coronal portion of the pulp has a scalloped appearance owing to the presence of large vacuoles. There is also heavy vacuolization of the pulp tissue. One large and three small denticles are present, two of them fused (×30, reduced to about ×22)

fluoride, for caries prevention, to a tooth having carious lesions extending into the dentin, might allow sodium fluoride to be in contact with the dentin during the treatment (four treatments of three minutes each) and thus cause harmful pulp reactions?

Further study will be the only means of determining an answer to the first of these questions: whether these reactions are progressively constructive or destructive or cause any change in the vitality of the pulp. Such a study should be concerned with the effects after greater time periods between application and extraction, as well as with the reactions of older teeth and hypersensitive teeth where the dentin is believed not to be so permeable as in the teeth selected for this study.

At the present time, the last two questions can be answered only by stating that sodium fluoride should be used with caution in every respect until all toxicities have been eliminated. Certainly the use of sodium fluoride as an agent for treating hypersensitive dentin should be accompanied by full recognition of the possible consequences of such a procedure, until further research gives evidence that there is no danger in its use.

In summary, therefore, the following

conclusions can be drawn from this study:

1. Sodium fluoride effectively desensitizes freshly cut dentin when applied topically to it.

2. There is histologic evidence that there is a definite reaction of the young pulp in response to the irritation of the cutting of dentin. This reaction varies in severity according to the depth of the cutting.

3. There is histologic evidence that the dental pulp is affected by the application of sodium fluoride to freshly cut dentin for a period of five minutes, in a manner differing from the reaction of the pulp to operative procedures.—*Northwestern University Dental School.*

MASTICATION, THE DETERGENT, THE ADEQUATE AND THE LOW-SUGAR DIETS: THEIR EFFECTS ON DENTAL CARIES

By John C. Brauer, D.D.S., M.Sc., Los Angeles

A DISCUSSION of the several points relating to the diets of humans, and the present day knowledge concerning the effect of such on the etiology or the control of dental caries, is initiated best by listing some common areas of agreement generally accepted today. The conclusions, which received unanimous support by the participants of the Michigan Workshop on "The Evaluation of Dental Caries Control Technics,"[1] after an exhaustive and critical evaluation of published data and statements, are significant. The definition of dental caries which emanated from the Michigan Workshop, represents the generally accepted present day concept of this disease.

Dental caries is a disease of the calcified tissues of the teeth. It is caused by acids resulting from the action of micro-organisms on carbohydrates, is characterized by a decalcification of the inorganic portion and is accompanied or followed by a disintegration of the organic substance of the tooth. The lesions of the disease predominantly occur in particular regions of the tooth, and their type is determined by the morphologic nature of the tissues in which they appear.

While the definition of the disease now is accepted commonly, it also is evident that the cause of dental caries is not understood completely, and that there is no single factor which in itself will control tooth decay.[2-6] One must conclude

Read at the annual session of the American Dental Association, Chicago, September 14, 1948.

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1. The Michigan Workshop on the Evaluation of Dental Caries Control Technics. *J.A.D.A.* 36:3 (January) 1948.

2. Council on Dental Health, American Dental Association, Statement on Control of Dental Caries. *J.A.D.A.* 34:502 (April 1) 1947.

3. Fosdick, L. S., The Etiology and Control of Dental Caries. *J.A.D.A.* 29:2132 (December 1) 1942.

4. Graber, T. M., Local Factors in Dental Caries: A Critical Review of the Literature. *J.A.D.A.* 35:92 (July 15) 1947.

5. Kesel, R. G., Dental Caries: Etiology, Control and Activity Tests. *J.A.D.A.* 30:25 (January 1) 1943.

6. Knutson, J. W., Workshop in Dental Health Planning, Present Status of Preventive Procedures. *J. Oregon D.A.* 16:34 (November) 1947.

then that there are numerous complex variables associated with the environment of the oral cavity and which are related to the etiology and control of dental caries.

Several points as related to diets and the effect on dental caries will be considered in the discussions that follow.

Effect of Mastication

The act of chewing or the grinding of food in the oral cavity is referred to as mastication. The exact relationship of mastication to the etiology or to the control of dental caries is harbored in that group of complex variables which is influenced by the size and shape of the jaws and teeth, by the number of teeth and their relative positions as well as restorations and by the musculature of the oral cavity. The several variables, only a small number when compared to the entire gamut of complexities, do involve the flow and distribution of saliva as well as the excursion of foods, water and other items which may be introduced into the oral cavity.

If one supports the findings and the interpretations of Fosdick, and his approach to the entire caries problem does seem rational, then mastication considered in the broadest sense potentially does influence the rate of caries attack. Fosdick[3, 4, 7] has depicted in Charts 1 and 2 the factors which influence and which inhibit dental caries. He indicates that there are two clear-cut processes (acid neutralizing and acid forming factors) opposing each other, the results of which will determine whether the teeth will decay. The neutralizing factor is so powerful that the pH of the mixed saliva is never sufficiently acid to decalcify teeth no matter how active the carious process is. Unfortunately, the saliva cannot reach all parts of the mouth such as pits and fissures and other areas of stagnation that are the result of improper development, poor contacts or irregular teeth. The Michigan Workshop[1] in reporting on the factors just discussed stated:

> The effect of the caries process on the tooth is made possible by circumstances or structures which retain sufficient acid in contact with the tooth substance. These factors, not necessarily listed in their order of relative importance, include (1) the dental plaque, an organic nitrogenous mass containing multitudes of micro-organisms firmly adhering to the teeth, (2) the anatomic characteristics of the tooth, (3) the position or arrangement of the teeth in the dental arch and (4) the presence of dental appliances.

This group commented further by saying that:

> There are also natural factors in the mouth which contribute to the dissipation of acids formed on the tooth surface, such as the amount of saliva and the buffering capacity of the saliva. A few reports have suggested that resistance to dental caries in human beings may be accounted for by inhibitory substances. Until such time as more evidence is available to indicate the identification and action of these factors it is necessary merely to recognize their possible role.

The conclusion as submitted by the Workshop is a logical one. It places before the profession another reason for executing the finest operative procedures in the anatomic restoration of teeth, and for a continuous consideration of all the factors related to occlusion. It emphasizes the need for all dental practitioners to be cognizant of the many factors which affect occlusion from early childhood throughout life.

Detergent Diets

There is no substantial evidence that fibrous foods, uncooked fruits or vegetables or so-called detergent foods reduce the caries attack rate.[1]

The toothbrush, dentifrices and mouthwashes are employed for the cleaning of

7. Fosdick, L. S., A Correlation of Some Facts Concerning the Etiology and Control of Dental Caries. *J. Canad. D.A.* 9:359 (August) 1943.

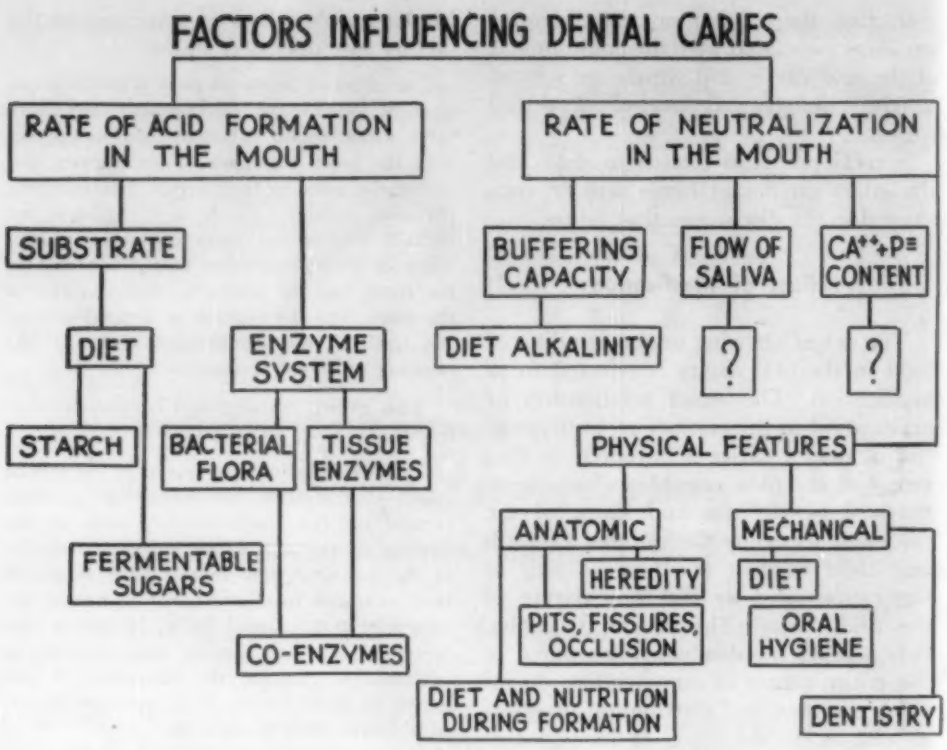

Chart I

teeth, and in general the detergent foods act on this same principle. It is not known what degree of effectiveness the cleansing qualities of a detergent food might have as compared to the toothbrush, the dentifrice and the mouthwash. Nevertheless such a parallel may be suggested to establish some measure of effectiveness in favor of the detergent foods.

Will brushing the teeth immediately after the ingestion of sugar reduce the amount of acid formed? The literature indicates that toothbrushing under these circumstances will reduce the total amount of acid produced. It has been stated that toothbrushing will remove most of the accessible plaque material, leaving so little that a satisfactory measurement of pH change cannot be obtained. Accordingly, one could assume that there would be less acid produced after brushing.[1] There is evidence, also, that bacterial plaques usually re-form rapidly, and that the count of acidogenic bacteria cannot be reduced over any appreciable period of time by toothbrushing. The use of a dentifrice does contribute to the prevention of plaque formation on those surfaces of the teeth which are accessible to the bristles of the toothbrush. However, the use of a dentifrice with a toothbrush will not prevent entirely the formation of some plaques. It is recognized, too, that rinsing the mouth with tap water may reduce the bacterial content temporarily by mechanical means and may dilute the bacterial substrate.

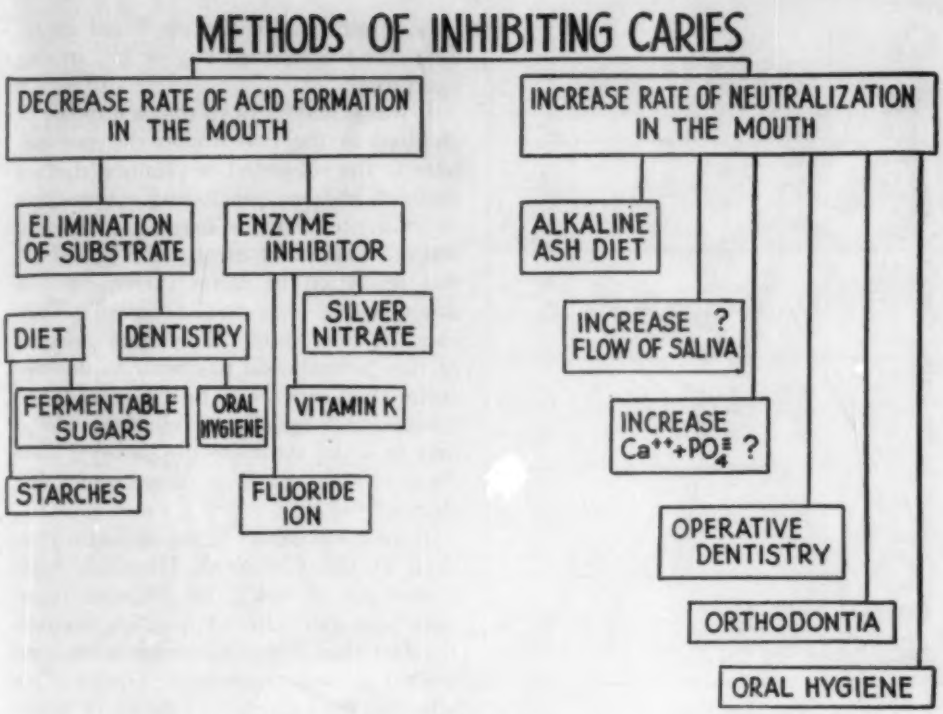

Chart 2

In general, it may be concluded that toothbrushing with acceptable aids should be recommended for various reasons, although the evidence that such measures are effective in the prevention of dental caries is limited and, at present, inadequate.[1]

Effect of Adequate Diets

Boyd[8] maintains that tooth decay will not develop or progress in the child who receives and utilizes a diet which is fully adequate in all respects for the needs of the body. Compare the diet recommended by the University of Iowa (Table 1) with the allowances recommended by the National Research Council (Table 2). A study of 111 diabetic children, with an age range from 2 to 15 years, was conducted by Boyd, wherein the average period of observation exceeded five and one half years, and wherein the age level at the initial observation varied from 14 months to 14 years. These data reveal that the D. M. F. rate per annum which is ordinarily expected in an average group of children was reduced at least 50 per cent. The D.M.F. in this instance refers to the number of decayed, missing and filled tooth surfaces. Another study by Boyd[9] showed that the caries rate, in a group of 55 diabetic adolescent individuals, was reduced to 0.695 D.M.F. tooth surfaces per annum, or approxi-

8. Boyd, J. D., Nutrition as It Affects Tooth Decay. *J. Am. Dietet. A.* 18:211 (April) 1942.

9. Boyd, J. D., Prevention of Dental Caries in Late Childhood and Adolescence. *J.A.D.A.* 30:670 (May 1) 1943.

Table 1.—Protective factors supplied through diets recommended for normal children by the State University of Iowa

Prescribed daily intake of specified foods	Protein Gm.	Calcium Gm.	Iron mg.	Vitamin A units	Thiamin (B_1) mg.	Ascorbic acid (C) mg.	Riboflavin (G) mg.	Nicotinic acid (PP) mg.	Vitamin D units	Calories
1 qt. milk	32	1.000	0.24	1,000	.168	10	1.528	4.0	16	680
1 egg	7	.068	2.52	375	.044	.....	.177	3.3	8	75
100 Gm. lean meat	19	.013	4.10	53	.182	.....	.235	6.7	.....	200
8 oz. vegetables (2)	4	.108	3.24	11,000	.360	50	.494	0.5	.....	50
8 oz. fruits (2)	2	.026	0.96	900	.102	38	.190	0.5	.....	218
1 tsp. fish liver oil	.....	.....	.....	6,000	.....	.....	.....	.....	600	36
6 tsp. butter	.....	.004	0.05	380	.....	.....	.....	.....	18	200
3 slices bread	6	.024	0.75	.....	.300	.....	.090	1.0	.....	195
100 Gm. cereal	4	.011	0.59	.....	.131	.....	.....	1.0	.....	90
150 Gm .potato	4	.021	1.27	45	.174	15	.108	2.0	.....	145
Totals	78	1.275	13.72	19,753	1.461	113	2.822	19.0	642	1,900 approx.
Values recommended by National Research Council	70	1.200	12.00	4,500	1.200	75	1.800	12.0	400-800	2,500

mately one half of the predicted increment for the average boy or girl in this age group.

It was stated by Boyd that a number of children in the two studies did not adhere to the suggested or planned dietary regimen, thereby precluding a reduction in incidence of dental caries greater than shown. The exact mechanism by which this reduction in caries increment was accomplished was not discussed. However, he does state. "The main purpose of this presentation has been to demonstrate that caries can be prevented and arrested through dietary measures alone, and to make available the detailed data from which such a conclusion was drawn."

I have examined many diabetic children at the Children's Hospital, State University of Iowa, at different intervals, and can without question confirm the fact that dental caries has been controlled as well as arrested. The children who had not experienced caries, or whose caries activity was slight, were those who followed the suggested nutritional program thoroughly. These diabetic individuals, because of their insulin deficiency, did receive a lesser amount of refined sugar than the average normal child. While Boyd believes that the lesser incidence of caries in these children was the result of a more adequate nutritional program than that received by the average child, the fact remains that these children also had a restricted sugar intake.

The findings of Schour and Massler[10] in conjunction with the studies of the Italian Medical Nutrition Mission in postwar Italy do not parallel those of Boyd. Schour and Massler, in an examination of 3,905 persons in Italy who were malnourished, had a high percentage of rickets and who rarely practiced oral hy-

10. Schour, Isaac, and Massler, Maury, Dental Caries Experience in Postwar Italy (1945): 1. Prevalence in Various Age Groups. *J.A.D.A.* 35:1 (July 1) 1947.

Table 2.—Chart of recommended daily allowances for specific nutrients* compiled by Committee on Foods and Nutrition, National Research Council

	Calories	Protein	Calcium	Iron	A†	Thiamin (B^1)‡	Ascorbic acid (C)‡	Riboflavin	Nicotinic acid	Vitimin D
		Gm.	Gm.	mg.	I.U.	mg.	mg.	mg.	mg.	I.U.
Man (70 kg.)										
Moderately active	3000	70	0.8	12	5000	1.8	75	2.7	18	
Very active	4500					2.3		3.3	23	§
Sedentary	2500					1.5		2.2	15	
Woman (56 kg.)										
Moderately active	2500	60	0.8	12	5000	1.5	70	2.2	15	
Very active	3000					1.8		2.7	18	§
Sedentary	2100					1.2		1.8	12	
Pregnancy (latter half)	2500	85	1.5	15	6000	1.8	100	2.5	18	400–800
Lactation	3000	100	2.0	15	8000	2.3	150	3.0	23	400–800
Children up to 12 years										
Under 1 year**	100 per kg.	3–4 per kg.	1.0	6	1500	0.4	30	0.6	4	400–800
1 to 3 years	1200	40	1.0	7	2000	0.6	35	0.9	6	
4 to 6 years¶	1600	50	1.0	8	2500	0.8	50	1.2	8	
7 to 9 years	2000	60	1.0	10	3500	1.0	60	1.5	10	§
10 to 12 years	2500	70	1.2	12	4500	1.2	75	1.8	12	
Children over 12 years										
Girls: 13 to 15 years	2800	80	1.3	15	5000	1.4	80	2.0	14	
16 to 20 years	2400	75	1.0	15	5000	1.2	80	1.8	12	§
Boys: 13 to 15 years	3200	85	1.4	15	5000	1.6	90	2.4	16	
16 to 20 years	3800	100	1.4	15	6000	2.0	100	3.0	20	§

*These are tentative allowances toward which to aim in planning practical dietaries. These allowances can be met by a good diet of natural foods; this will also provide other minerals and vitamins, the requirements for which are less well known.

†Requirements may be less than these amounts if provided as vitamin A, greater if chiefly as the pro-vitamin carotene.

‡1 mg. thiamine equals 333 International Units; 1 mg. ascorbic acid equals 20 International Units (1 International Unit equals 1 U.S.P. unit).

**Needs of infants increase from month to month. The amounts given are for approximately 6 to 18 months. The amounts of protein and calcium needed are less if from breast milk.

§Vitamin D is undoubtedly necessary for older children and adults. When not available from sunshine, it should be provided probably up to the minimal amounts recommended for infants.

¶Allowances are based on the middle age for each group (as 2, 5, 8, etc.), and for moderate activity.

Table 3. Comparison of incidence of dental caries of Italian with United States children ages 6 to 20*

Age group	Four Italian cities		United States	Percentage of caries-free persons	
	Total number of patients	D.M.F.† teeth per person	D.M.F. teeth per person	Four Italian cities	Average in United States‡
6 to 10 yrs.	683	2.41§		2.96**	
11 to 15 yrs.	475	1.05§	4.66	53.4**	9.5
16 to 20 yrs.	247	2.02	8.50	38.4	1.9

*Data adapted from report of Schour and Massler.[10]
†Decayed, missing because of extraction and filled.
§Carious deciduous teeth are included in the count.
‡Permanent teeth only. Averages obtained from study by Klein and Palmer[11] (cited by Schour and Massler).
**Deciduous teeth included.

giene, found a caries prevalence from two to seven times lower than that observed in the United States (Table 3).[10, 11] The Italian diet, according to these two authors, is predominantly carbohydrate, consisting largely of spaghetti, macaroni and bread. However, the Italian's intake of refined sugars is low. The Italian study further indicated that the majority of the persons examined showed clinical signs of vitamin B deficiency. It is explained that the high incidence of clinical vitamin B deficiency may be in part the result of the high carbohydrate diet. Such a dietary program requires more than the average amount of vitamin B complex for its metabolism. It also has been pointed out by Dreizen and others[12] that the vitamin B complex is essential for the complete degradation of the carbohydrates to acid end products, and that the lack of nicotinic acid and thiamin may inhibit acid production in the mouth.

The findings of Schour and Massler are comparable to those cited by Cady,[13] wherein he found a relatively low incidence of caries in malnourished Dutch children residing in Coventry, England, and comparable to that of Day,[14] Friel,[15] and others.[16, 17]

Schour and Massler[10] in accordance with their experiences firmly believe that there is sufficient evidence to suggest that the incidence of caries is not increased with lowered nutrition or even malnutrition.

Two significant questions were reviewed at the Michigan workshop: (1) Has the diet of the people in the United States improved since 1900?

11. Klein, Henry, and Palmer, C. E., On the Epidemiology of Dental Caries, in *Dental Caries*. Philadelphia: University of Pennsylvania Press, 1941, pp. 1-25.

12. Dreizen, Samuel, and others, The Buffer Capacity of Saliva as a Measure of Dental Caries Activity. *J. D. Res.* 25:213 (August) 1946.

13. Cady, F. C., What Five Years of War Did to the Teeth of Dutch Children. *Oral Hyg.* 36:246 (February) 1946.

14. Day, C. D. M., Nutritional Deficiencies and Dental Caries in Northern India. *Brit. D.J.* 76:115 (March 3) 1944 and 76:143 (March 17) 1944.

15. Friel, Sheldon, The Effects of the War Diet on the Teeth and Jaws of the Children of Vienna, Austria. *Internat. J. Orthodont., Oral Surg. & Radiography* 8:539 (September) 1922.

16. Oliver, D. H., Some Evidence of Wartime Reduction of Caries Incidence in Children. *Brit. D.J.* 80:115 (February 15) 1946.

17. Mann, A. W., and others. A Comparison of Dental Caries Activity in Malnourished and Well-nourished Patients. *J.A.D.A.* 34:244 (February 15) 1947.

(2) Has the dental caries attack rate increased since 1900? The following information was submitted on the two questions:

> The per capita food supplies in this country are bountiful compared with those of most other parts of the world. The per capita volume has remained fairly constant during the last three decades, but within the total, the relative importance of various foods has been shifted. There has been a phenomenal rise in the consumption of sugar and citrus fruits, and an upward trend in the consumption of dairy products. From the standpoint of nutrition, certain of these trends in food consumption have enriched the diets of the American people while others have impoverished them. On the credit side, for example, is the increase in the consumption of dairy products, fruits and succulent vegetables; on the debit side, the increase in consumption of refined sugar.[3,18]
>
> If the two studies[19,20] available to the committee are indicative of national trends, it may be assumed that the dental caries attack rate has increased.

The group at the Michigan Workshop concluded there was insufficient evidence that an adequate, optimal or balanced diet as outlined by the Food and Nutrition Board, National Research Council, would influence the caries attack rate; however, it was imperative that a diet conducive to individual health be advocated.

One extremely important factor frequently has not been considered in the discussions of what constitutes an adequate, optimal or balanced diet; that is, do the foods consumed by man or animal actually contain what the "tables of allowances and contents" indicate? While an individual actually may take into his body all the recommended foods set forth by the Food and Nutrition Board of the National Research Council or by a nutritionist, there is no guarantee that such foods really contain the recorded vitamins and minerals. There is unquestionable evidence that climate and soils are in a large measure the determining factors of what nutritional essentials are present in the foods. It is known that the dozen or more soil-borne elements needed by our body are not all commonly present in every soil. Soil exhaustion, whether by high rainfalls or excessive cropping, invites nutritional deficiencies.[21-23] Dentistry and medicine must be cognizant of this increasingly important problem as related to the health, and, therefore, the security of this nation. While there is no evidence today to warrant the conclusion that the adequacy of the diet can materially influence the caries increment, it must be admitted that individuals do have a difference in the degree of vulnerability to this disease. The factors which determine the degree of susceptibility to caries, and which are in operation in the oral cavity, have not been evaluated in their entirety. One, therefore, cannot discount the value of adequate nutrition as a potential factor in the control of caries.

Effect of Low-Sugar Diets

The available evidence at this time favors the restriction of sugar, either refined or natural, in the control of dental caries.[24-30] It also is concluded that the

18. Stiebeling, Hazel K., Adequacy of American Diets, in Council on Foods and Nutrition, American Medical Association, *Handbook of Nutrition*. Chicago: American Medical Association, 1943.

19. Brekhus, P. J., *Your Teeth, Their Past, Present and Probable Future*. Minneapolis: University of Minnesota Press, 1941.

20. Wisan, J. M., and Chilton, N. W., Studies in Dental Public Health Administration: IV. Dental Caries Experience of New Jersey School Children. *J.A.D.A.* 37:519 (November) 1948.

21. Albrecht, W. A., Climate, Soil and Health. II. Managing Health via The Soil. *Oral Surg., Oral Med., & Oral Path.* 1:206 (February) 1948.

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25. Becks, H.; Jensen, A. L., and Millarr, C. B., Rampant Dental Caries: Prevention and Prognosis. A Five Year Clinical Survey. J. D. Res. 23:210 (June) 1944.

26. Bibby, B. G.; Volker, J. F., and Van Kesteren, M., Acid Production and Tooth Decalcification by Oral Bacteria. *J. D. Res.* 21:61 (February) 1942.

restriction of sugar will improve the dietary provided the caloric intake remains adequate.[1]

The Council on Dental Health of the American Dental Association, in a review of the entire problem, has submitted this statement.[2]

> It is now widely believed that decay of the enamel is caused by acids produced in the fermentation of sugars. For this reason, the use of sugar should be restricted, and a considerable reduction in sugar consumption can be achieved by eliminating confections and sweetened beverages from the diet.

The findings of Schour and Massler[10] in their Italian studies also support strongly the contention that a low sugar diet is effective in the control of dental caries. Schour and Massler further confirm the statements of Jay,[31] and Schweigert and others,[32] that many people may eat liberal amounts of starchy foods and yet remain relatively free from dental caries, provided the intake of refined sugar is low. The per capita consumption of sugar per year in 1930-1934 was 18 pounds in Italy as compared with 103 pounds in the United States. During the war the sugar consumption in Italy per capita was reduced appreciably.[10]

There are many ways of securing a rather large intake of sugar even though candies are eaten rarely. Some individuals believe that the restriction of candies, possibly syrups, and cake, is sufficient. However, there are many other sources of sugars as may be noted from the table prepared by Hoffman of the Iowa State Department of Health (Table 4).

Jay[29-31] and others[7, 25, 27, 28] have demonstrated repeatedly the high correlation of lactobacilli in the saliva and the degree of caries activity. It has been found, too, that the organisms responsible for the acid production in the oral cavity can be reduced effectively in number and the incidence of caries reduced accordingly by the restriction of carbohydrate in the diet.

Jay and Beeuwkes[33] have outlined a low carbohydrate dietary schedule for various age levels with full consideration of the basic recommendations made by the Council on Foods and Nutrition of the National Research Council. The dietary program recommended is one which markedly reduces the carbohydrate intake the first two weeks and then gradually increases the carbohydrate and sugar content over a period of time.

Boyd, too, in his studies and findings on diabetic children has evidenced a significant reduction in dental caries experience. The dietary regimen recommended by Boyd for the diabetic children is an excellent one which could be followed by most children to great advantage (Table 1). The diabetic patient of course is under strict discipline, in that he must limit his sugar intake. Unfortunately, few children are required or are willing to follow such a disciplined dietary regimen even though large dividends would accrue.

While the reduction in refined sugars and carbohydrates is recommended strongly, and it may be concluded that dental caries virtually can be eliminated by this procedure, one cannot dismiss the other contributing factors, which have been observed in a small percentage of the population. It is well known that some children and adults can consume much larger quantities of refined sugars and carbohydrates than others without

27. Fosdick, L. S., Carbohydrate Degradation by Mouth Organisms. I. *J.A.D.A.* 26:415 (March) 1939.

28. Fosdick, L. S., and Starke, A. C., Jr., Carbohydrate Degradation by Mouth Organisms. III. L. Acidophilus. *J.A.D.A.* 28:234 (February) 1941.

29. Jay, Philip, The Role of Sugar in the Etiology of Dental Caries. *J.A.D.A.* 27:393 (March) 1940.

30. Jay, Philip, and Esser, Ann, Further Studies on the Etiology and Control of Dental Caries. *J.A.D.A.* 17:1117 (June) 1930.

31. Jay, Philip, Nutrition and Dental Caries. *J. New Jersey D. Soc.* 15:20 (January) 1944.

32. Schweigert, B. S., and others, Dental Caries in the Cotton Rat. VIII. Further Studies on the Dietary Effects of Carbohydrate, Protein and Fat on the Incidence and Extent of Carious Lesions. *J. Nutrition* 32:405 (October) 1946.

33. Jay, Philip, and Beeuwkes, A. M., University of Michigan, Dental Caries Prevention Service. (July-Revision) 1946.

experiencing dental decay. Jay[34] said, "As they grow older caries become inactive in many of these individuals, despite the fact that they continue to maintain a very high level of carbohydrate consumption. There is no satisfactory explanation for this transition except that it is accompanied by a change in the bacterial flora of the mouth, characterized by a decline in the growth of the lactobacilli. It seems now that these periods of comparative immunity may be induced at will by a drastic reduction in carbohydrate intake for short periods of time." Further, Jay[29] stated:

Those of us who have had the opportunity to follow the lactobacillus counts in the saliva of patients on high and low carbohydrate intake have been very much impressed by the rapidity with which the counts respond to variations in carbohydrate intake. There are, nevertheless, many puzzling facts to remind us that this alone does not determine caries immunity. As an illustration, it has been observed by most clinicians that some persons are able to enjoy diets in which highly sweetened foods are eaten in large amounts with no apparent effect on the caries rate. It has also been observed that an individual may not react to high carbohydrate consumption in the same manner at different times.

He further stated:

We have in the past reported cases in which patients remained free from lactobacilli and caries after drinking a quart of acidophilus

34. Jay, Philip, The Reduction of Oral Lactobacillus Acidophilus Counts by the Periodic Restriction of Carbohydrate. *Am. J. Orthodont. & Oral Surg. (Sec. on Oral Surg.)* 33:162 (March) 1947.

Table 4.—Carbohydrate evaluation. The approximate refined carbohydrate content of popular foods expressed in amounts equivalent to teaspoonfuls of sugar*

Items	Amounts	Equivalents in sugar
Hershey bar	61 Gm. (5 cent size)	7 tsp.
Butterscotch	5 Gm. 1" x 1"	1 tsp.
Chewing gum	1 cent stick	⅔ tsp.
Life saver	1 usual size	⅓ tsp.
Jam	20 Gm. 1 level tbsp. or 1 heaping tsp.	3 tsp.
Syrup, maple	20 Gm. 1 level tbsp. or 1 heaping tsp.	2½ tsp.
Honey	20 Gm. 1 level tbsp. or 1 heaping tsp.	3 tsp.
Angel cake	45 Gm. 1 piece (1/12 of large cake)	6 tsp.
Chocolate cake	100 Gm. 2 layer, icing (1/12 cake)	15 tsp.
Doughnut, plain	40 Gm. 3" diameter	4 tsp.
Brown Betty	130 Gm. ½ cup	9 tsp.
Ice cream	⅛ quart	5 to 6 tsp.
Apple pie	⅙ of medium pie	12 tsp.
Cherry pie	⅙ of medium pie	14 tsp.
Chocolate, all milk	1 cup, 5 oz. milk	6 tsp.
Coca-Cola	180 Gm. 1 bottle, 6 oz.	4⅓ tsp.
Gingerale	180 Gm. 6 oz. glass	3⅓ tsp.
Prunes, stewed (sweetened)	100 Gm. 4 to 5 medium, 2 tbsp. juice	8 tsp.
Raisins	30 Gm. ¼ cup	4 tsp.
Orange juice	100 Gm. ½ cup, scant	2 tsp.
Grapefruit juice (unsweetened)	100 Gm. ½ cup, scant	2½ tsp.
Grape juice, commercial	100 Gm. ½ cup, scant	3⅓ tsp.

100 grams sugar = 20 teaspoons = ½ cup = 3½ ounces = 400 calories.
Candy runs from 75 per cent to 85 per cent sugar. Popular candy bars are likely to weigh from 1 ounce to 5 ounces and may contain from 5 to 20 teaspoons of sugar.

*From the Iowa Dental Bulletin, April 1947.

milk daily, and we have also failed, in some cases, to induce a rise in the lactobacillus counts of subjects who have never had caries by the feeding of huge amounts of candy. This all suggests that certain patients are periodically or permanently immune to caries.

Collins, Jensen and Becks,[35] in a study of 122 caries-free individuals, found that 99, or 81.1 per cent, had a negative lactobacillus acidophilus index, while 23, or 18.9 per cent, were positive with a high lactobacillus acidophilus count. During this same study another group of 122 individuals was analyzed who had rampant caries, and in this group 12.3 per cent had negative counts. A number of individuals in the caries-immune group had a very high, and a number in the caries-susceptible group had a very low, intake of concentrated sweets and sugars. It was stated, "This suggests that the carbohydrate consumption alone does not explain the absence or presence of dental caries in these cases, and that other etiologic factors must be sought." These authors further said, "This strongly suggests that each individual may have a carbohydrate limit within which he continues free of dental caries and which, when exceeded, exposes him to the ravages of this increasingly prevalent disease." These authors also said that in this study there was no significant difference between the non-carious and carious individuals on the basis of nutritional adequacy.

Significant studies also have been made with reference to saliva. Kesel,[36] Hill,[37] and others, for example, have demonstrated a bacterial inhibiting substance in saliva. Hill placed a diluted culture of L. acidophilus in saliva which was freshly collected from caries non-susceptible subjects. This mixture was incubated for 24 hours. The lactobacilli were found to have disappeared despite the addition of dextrose, which should have stimulated their growth. Kesel in a repetition of this study had similar results.

Having considered the several potentials relating to caries susceptibility and caries resistance, the following questions, logically, can be asked:

1. Why is there a change in bacterial flora of the mouth, characterized by a decline in the growth of the lactobacilli in some individuals as they grow older?

2. Why, in the study conducted by Collins, Jensen and Becks,[35] were there evident a number of individuals in the caries-resistant group who had a very high, and a number in the caries susceptible group who had a very low, intake of concentrated sweets and sugar?

3. What produces the variation in tolerance for refined sweets and carbohydrates in individuals?

4. Can an individual with an adequate intake of nutritional essentials expect to influence the oral environment (saliva), and thereby produce a higher tolerance level to refined sweets and carbohydrates?

5. Is there a bacterial balance in the oral cavity, which if disturbed by certain systemic or oral conditions gives an advantage to the L. acidophilus?

Collins, Jensen and Becks[35] have this to say regarding their study, "It is not to be overlooked that such factors as heredity, familial tendencies, environment, geographic location and possible dietary essentials not assessed in this study may play a role in conferring upon this small percentage of persons an unusual resistance to dental caries."

Conclusions

1. The incidence of dental caries has not been reduced in the American population during the past generation.

35. Collins, R. O.; Jensen, A. L., and Becks, Hermann, Studies of Caries-Free Individuals: II. Is an Optimum Diet or a Reduced Carbohydrate Intake Required to Arrest Dental Caries? *J.A.D.A.* 29:1169 (July) 1942.

36. Kesel, R. G.; O'Donnell, J. F.; Kirch, E. R., and Wach, E. C., Ammonia Production in the Oral Cavity and the Use of Ammonium Salts for the Control of Dental Caries. *Am. J. Orthodont. & Oral Surg. (Sec. on Oral Surg.)* 33:80 (February) 1947.

37. Hill, T. J., A Salivary Factor Which Influences the Growth of L. Acidophilus and Is an Expression of Susceptibility or Resistance to Dental Caries. *J.A.D.A.* 26:239 (February) 1939.

2. While all of the factors regarding the etiology of dental caries are not known, there are effective measures for the control of this disease.

3. It is agreed, generally, that refined sweets, when introduced into the oral cavity above the tolerance level of the particular individual, are a predisposing factor to dental caries.

4. The mechanisms and physiologic reactions, which tend to establish caries resistance in a relatively small percentage of individuals, need further study and investigation.

IMPORTANCE OF EVALUATING MOUTH CONDITIONS PREPARATORY TO THE CONSTRUCTION OF PARTIAL DENTURES

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It is a common occurrence for persons to report to their dentists that they are dissatisfied with their partial dentures and are unable to wear them. On the basis of their complaints, it may be stated that a partial denture fails when it is causing irritation, pain and discomfort; when its use is permitting destructive changes to take place in the tissues; when it is rendering inefficient service and when it is failing to satisfy esthetic possibilities.

These failures may be due to structural defects. Clasp arms, when made of metal too soft in character or when they are too small in cross section in comparison with their length, are easily bent out of shape. The same is true of bars which connect the saddles. When bars or clasps become distorted, the partial denture no longer fits, undue pressures are exerted upon the teeth and mucosa and irritation, pain and discomfort result.

Similar results take place when bars are insufficiently rigid and permit lateral spreading of the saddles under masticating stress. Although the distortion of the bar in this case may not be permanent, distortion is taking place and the patient experiences discomfort.

Another disturbing occurrence is the breakage of clasp arms and occlusal rests. This may be due to size inadequate to meet the demands of stress, to weakness in the metal or brittleness. Breakage of clasp arms destroys retentive and bracing effects originally furnished by the arm and may result in unreciprocated stress being placed upon the abutment tooth by an opposing arm. Breakage of occlusal rests removes the support originally furnished by the tooth and places it upon the mucosa adjacent to the tooth. Settling takes place and the clasp arms move toward the gingiva. An arm that originally rested upon the supporting area of the abutment tooth commences to exert a lateral stress. The movement gingivally of a retentive arm results in a loss of retention. Any part of an arm

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Fig. 1.—Evidence of high susceptibility to caries

which originally was close to the gingival tissues now rests upon these tissues, tending to push them out of position, to expose the cementum of the root and to cause irritation.

Another structural defect is the chipping and breakage of teeth, or the breakage of the part which joins the tooth to the base of the denture. This reduces masticating efficiency. It also may affect the esthetic appearance, especially if the tooth involved is in the front. Porcelain teeth seem to be more vulnerable than acrylic teeth to chipping and breakage. An isolated tooth, joined to the base of the denture by a narrow isthmus of material other than metal, is susceptible to breakage.

Tarnishing is another imperfection that may be classed as a structural defect. Tarnishing of a metal base may be due to the composition of the alloy or to porosity. If it is due to porosity, food debris will adhere more readily and the metal will be harder to cleanse. Although some dentists may think tarnishing too minor a defect to consider, nevertheless it is disquieting to the patient.

Failures in service of partial dentures can be ascribed, in part, to structural defects, but the materials now available, if properly handled, make it possible to reduce these failures to a minimum. Usually, however, failures of partial dentures are due to the careless observation and evaluation of the problem by the operator rather than to the work of the technician.

The importance of the examination, consideration of favorable and unfavorable aspects, evaluation of the possibilities for elimination or, at least, improvement of untoward influences—in other words, the careful inspection of the building site by the engineer in charge—cannot be stressed too strongly.

An efficient structural engineer uses all methods at his disposal preparatory to construction of a building. He looks over the topography of the site to gain a generalized idea; he makes excavations and tests to determine what lies hidden to view but upon which the building must rely for its support; he uses surveying instruments in order that all parts may be correctly coordinated and aligned in harmony with one another.

The dentist has similar means at his disposal by which the factors involved in partial denture work may be ascertained and evaluated. A generalized idea of topography and mouth conditions may be gained by a visual and digital examination, information about things hidden from view by utilizing the roentgenogram, and mechanical problems involved by means of study models and the dental surveyor. Just as the structural engineer is responsible if failure results because of hasty superficial examination, so is the dentist responsible if failure results when he has not used every means at his disdisposal in his survey and evaluation.

Visual examination will also reveal the presence or absence of signs of dental disease. Consideration of susceptibility to caries is of primary importance. The presence of many fillings, signs of recurring decay and white, chalky appearance of the enamel, all give evidence that caries susceptibility is high and that placement of a partial denture will in-

volve a risk. In these cases, if no alternative than a partial denture seems available, then the protection of all abutment teeth by means of crowns seems advisable. In extreme cases, the extraction of all remaining teeth and construction of complete dentures may be the best answer (Fig. 1).

Signs of the presence of periodontal disease also are detectable when making visual examination. Inflammation of the mucous membrane about the necks of the teeth and the degree of gum recession are readily observable. In addition, the depths of the pockets can be determined by instrumentation and the degree of mobility of the teeth by finger pressure. These findings, although important, should be amplified by the roentgenogram, the use of which will be mentioned later.

The number of teeth remaining and the location of the edentulous areas should be observed as these data have a bearing on the type of support which is available and this in turn has a bearing on the degree to which the mucosa should be utilized as a supporting structure.

For example, in a maxillary case in which teeth suitable as abutments are present at each end of two posterior edentulous areas, one on each side of the mouth, ample tooth support can be gained by means of occlusal rests and a narrow overarch or palatal bar will meet the requirements.

On the other hand, for similar conditions with no posterior teeth available for abutment—the so-called free end saddle case—a narrow palatal bar will be inadequate in many instances to meet the needs (Fig. 2A). Under these circum-

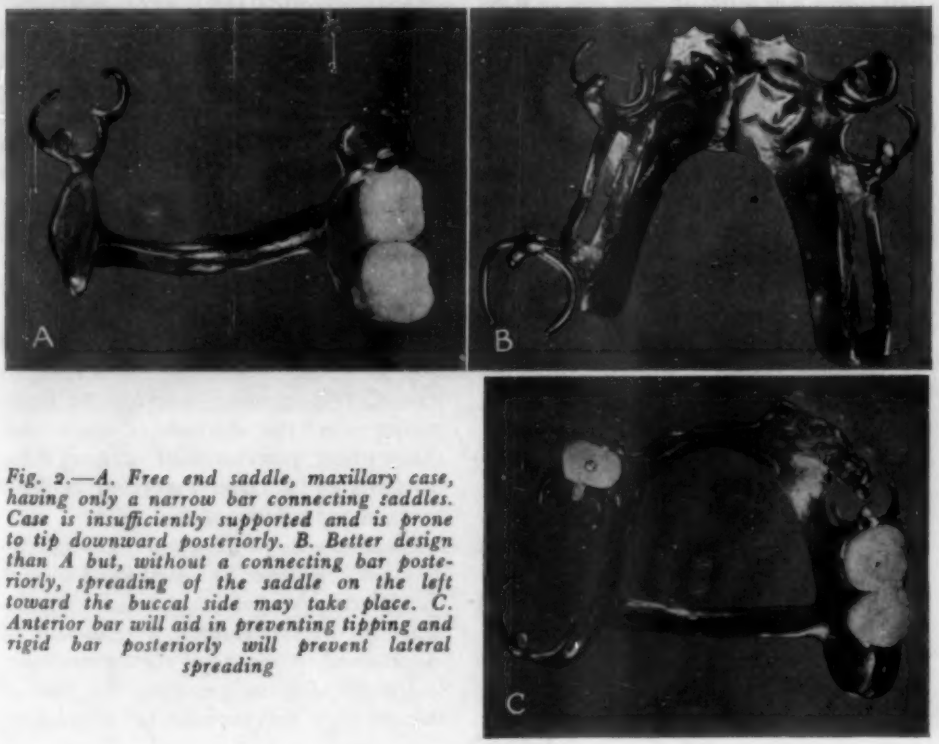


Fig. 2.—A. Free end saddle, maxillary case, having only a narrow bar connecting saddles. Case is insufficiently supported and is prone to tip downward posteriorly. B. Better design than A but, without a connecting bar posteriorly, spreading of the saddle on the left toward the buccal side may take place. C. Anterior bar will aid in preventing tipping and rigid bar posteriorly will prevent lateral spreading

Fig. 3.—Problem may appear simple when jaws are apart but should also be viewed with teeth in centric occlusion when evidence of complications may be apparent

stances there is less tooth support available. Therefore greater coverage of the mucosa for mucosa support is indicated and some means should be employed to prevent the tendency of the partial denture to tip downwards posteriorly.

The tendency to instability, when only two clasps and a narrow bar are used for the maxillary case having free end saddles, is due to the fact that the center of gravity of the partial denture is posterior to the imaginary fulcrum line connecting the two occlusal rests. Changing the general design, by coverage of the anterior part of the vault by means of an anterior bar, moves the center of gravity of the denture forward to become nearly within the fulcrum line (Fig. 2B). This, together with the contact of the bar with the sloping surface in the anterior part of the vault, enhances the stabilizing and bracing effects.

The free end saddle case, if extensive, needs not only coverage of the vault anteriorly but also a bar posteriorly (Fig. 2C) in order that spreading of the saddles, when subjected to masticatory stresses, will be prevented.

When there are but few remaining teeth—for example the upper six anteriors—or when the shapes of the teeth are such that tooth support will be limited, covering the entire vault may be advisable in order to attain maximum mucosa support.

In making the visual examination, the conditions should be observed not only when the jaws are apart but also when the jaws are closed and the teeth in centric occlusion (Fig. 3). A case which looks simple when the jaws are apart may be discovered to be complicated when the teeth are in occlusion. An extreme vertical overbite of the maxillary over the mandibular incisors complicates the problem of attaching anterior teeth to a maxillary denture. Extrusion of a tooth into an opposing edentulous area may complicate the placement of teeth in the edentulous area. Extrusion of a tooth in such a way that locking is produced may complicate clasp design.

When studying the centric occlusion of the teeth, it is well to determine, by means of an explorer point or by interposing wax, the amount of space that exists where placement of occlusal rests, or parts of a clasp involving occlusal areas, may be desired.

Although the signs of periodontal disease are detectable by visual examination, the full degree of damage to the supporting structures is hidden and should be ascertained by means of roentgenograms.

Immediately surrounding the root of the tooth is the periodontal membrane,

composed of the fibers of investing tissue which form the attachment between tooth and tooth socket to hold the tooth in position. The periodontal membrane, under normal conditions, should appear in the roentgenogram as a narrow dark line, slightly wider near the gingival border of the tooth and near the apex of the root and thinner in the area between (Fig. 4A).

Adjacent to the periodontal membrane is the layer of bone which forms the tooth socket and is called the "lamina dura." This layer is cortical bone and, being denser than both the cancellous bone which it overlies and the periodontal membrane, its contour is distinguishable in the roentgenogram by being a band lighter in color (Fig. 4A).

The bone underlying the lamina dura is cancellous in character, is more radiolucent, and appears in the roentgenogram as a grayish, lacelike network. Under normal conditions, this cancellous bone, together with the lamina dura, comes to a sharp crest, known as the "alveolar crest," near the gingival border of the tooth (Fig. 4A).

When the roentgenograms reveal an intact periodontal membrane, a normal contour of the lamina dura, and an unresorbed alveolar crest, conditions relative to support of the tooth can be evaluated as favorable. On the other hand, roentgenographic evidence that the periodontal membrane has been broken, that the contour of the lamina dura has been altered or that the alveolar crest has been resorbed, indicates that destruction of the bony support has been or is taking place (Fig. 4B). If destruction is extensive, acceptance of this support becomes questionable (Fig. 4C).

As a rule, if the alveolar crest has been resorbed to an extent greater, or if there are periodontal pockets deeper, than one fourth of the length of the root, if there is rarefaction at the apex of a root or rarefaction in the bifurcation of a multirooted tooth, it is advisable that

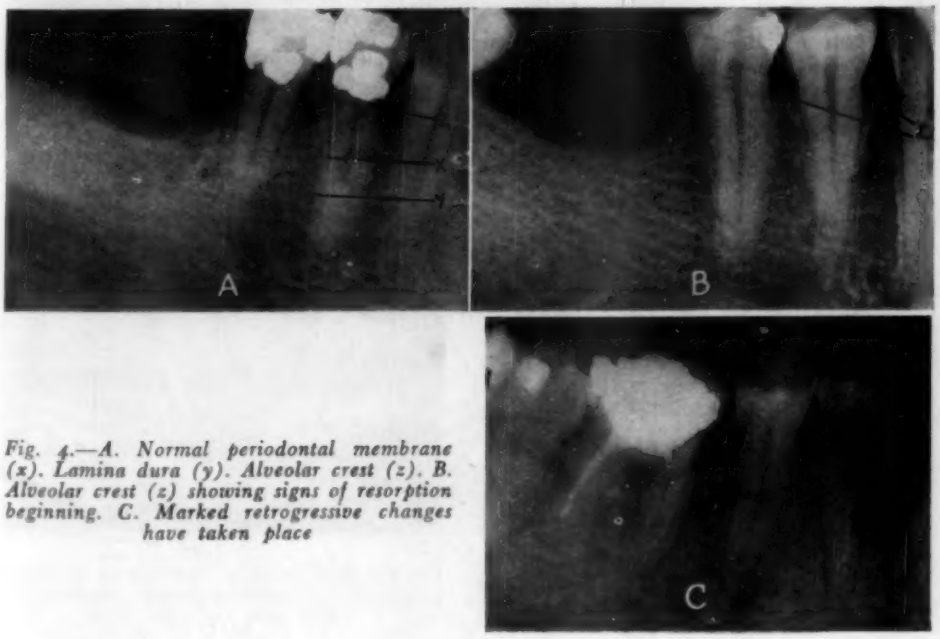


Fig. 4.—A. Normal periodontal membrane (x). Lamina dura (y). Alveolar crest (z). B. Alveolar crest (z) showing signs of resorption beginning. C. Marked retrogressive changes have taken place

Fig. 5.—Where to prepare occlusal rest areas varies and depends on which teeth are to be clasped and what type clasps are to be used

the tooth or teeth involved should be removed. At least it is inadvisable to consider for abutment purposes any tooth that is thus involved.

Adverse findings may be such that it will be advisable to recommend that all the teeth remaining be extracted and a complete rather than a partial denture be considered.

Evaluation of data concerning supporting structures is important. It is easy to inform a patient, before construction work is started, that certain teeth should be extracted, but it is embarrassing to have to convey this news after the denture has been completed or has rendered only a short term of service.

Additional information obtainable by means of the roentgenogram is the presence of unerupted teeth, broken-off root-tips, cysts and signs of residual infection, removal of which may be necessary before construction work is started. Hence, a roentgenographic survey is advisable, not only of the abutment teeth but of the entire arch.

Many failures in partial dentures can be ascribed to the fact that the teeth were not reshaped for proper reception of the clasps before the impression was taken for the master model. Especially is this applicable to the preparation of occlusal rest areas and the reduction of unfavorable tooth contours.

To neglect to prepare teeth for reception of occlusal rests is hazardous. Occlusal rests constructed to rest on unaltered marginal ridges are apt to overfill the available space and, when the denture is placed in the mouth, the occlusal rests will be found to interfere with occlusion. Correction of occlusion by reducing the thickness of the rest oftentimes results in a rest too thin and fragile to give adequate service.

If preparation of the occlusal rest areas is left until the master model is made and the areas are then prepared by altering the surfaces of the plaster teeth, the casting will not fit the natural teeth. It then becomes necessary to grind down the surfaces of the natural teeth for reception of the rests and to do this with any degree of accuracy is almost impossible. Casting a metal rest to fit a prepared area is simple; fitting a tooth to a rest already prepared is difficult.

Choice of places where the occlusal rest areas should be prepared depends on the teeth to be engaged and the type of rests to be used (Fig. 5). As regards shape, the casting process makes possible a large variety of clasps from which to choose. A rest area for one type of clasp may be in an entirely wrong location for

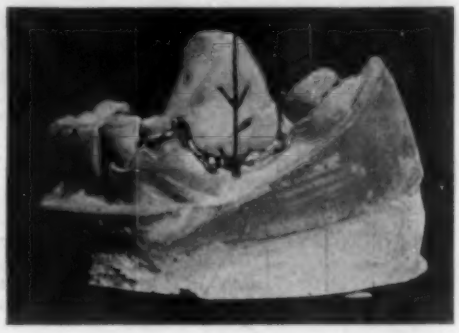


Fig. 6.—With path of insertion as indicated by arrow, a food-trap results between the molar and the rigid strut

a different type. For example, the location of the rest area for an average circumferential clasp to involve the buccal, distal and lingual surfaces of a lower bicuspid is usually over the distal marginal ridge. On the other hand, a back-action clasp on the same tooth and to involve the same surfaces, may necessitate an occlusal rest at the end of one of the arms and the rest area must be prepared on the mesial marginal rather than on the distal ridge.

Since the design of clasps is dependent upon the location of the retention and supporting zones on the tooth surfaces relative to the path to be followed in seating the denture, neglecting to reshape unfavorably inclined teeth by slightly dressing down the enamel of the unfavorably inclined surface and, if necessary, placing inlays and crowns, unnecessarily complicates the problems involved in clasp design. A sharply inclined tooth may make it necessary to place certain parts of a clasp so close to the occlusal surface of the tooth that these parts will interfere with the occlusion. A high degree of inclination of proximal surfaces may necessitate placement of rigid portions of clasps so far out of contact with these surfaces that undesirable food-traps will be formed (Fig. 6). To provide clearance for lingual bars, when passing lower posterior teeth which are inclined lingually, there may need to be so much space between bar and mucosa, when the appliance is fully seated, that not only will a food-trap be present but there will be interference with the tongue as well (Fig. 7). Slight reduction of unfavorable contours may greatly facilitate matters of design.

Fig. 7.—Path of insertion indicated by vertical spindles is favorable for molar on right but unfavorable for molar on left. If this path of insertion is finally accepted, mesiolingual area of molar on left needs reshaping

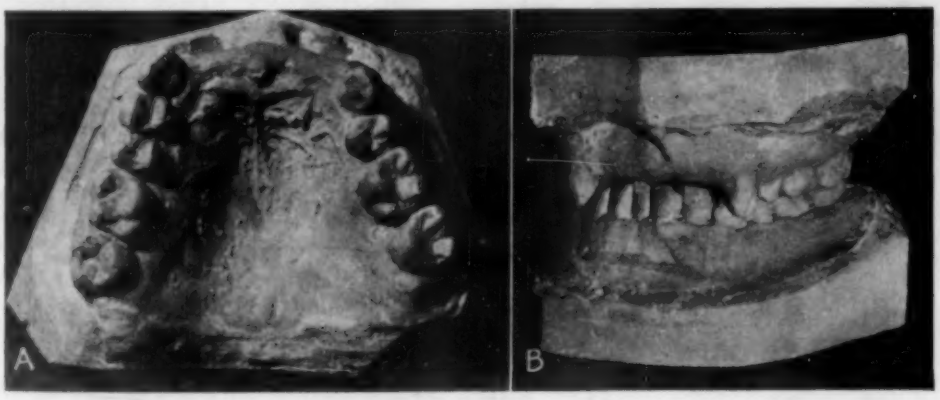


Fig. 8.—Model of one arch only (A) is insufficient if problems involving occlusion are present (B). Problem of attaching anterior teeth to the base not evident in A is markedly evident in B

The amount of reduction should be kept to a minimum and, after grinding, the surfaces should be highly polished. If it is not possible to produce the contour desired without involving the dentine, resort should be made to inlays or crowns.

Areas often needing correction are the lingual surfaces of lower bicuspids, mesial and lingual surfaces of lower molars, especially the mesiolingual line angle area, the mesiobuccal line angle area of upper molars, and the contact points of upper cuspids.

The degree of inclination of teeth and the location of retention and supporting areas are not readily interpreted by the naked eye but, since their evaluation is so important to success, a more dependable method is advisable. Such a method is the study of a plaster model of the mouth by means of a dental surveyor before reshaping of the teeth is attempted.

For surveying purposes, accurate models are essential. A model made by means of a compound impression is unreliable because compound drags when being withdrawn from an undercut area. The alginate and hydrocolloid impression materials are highly satisfactory and since they are so readily and easily manipulated, there seems no excuse for not making study models for all cases.

A model of arch for which the denture is being planned is sufficient if the opposing teeth do not present any problems. Where problems involving occlusion are present, models of both arches are advisable (Fig. 8).

The dental surveyor is a simple instrument, the main working part of which is a vertical scriber that can be brought into contact with the surfaces of the model to be studied (Fig. 9). The relation of the long axis of the scriber to the model indicates the path of insertion being studied which, if accepted, will be the path followed when inserting and removing the finished denture in the mouth. A model in horizontal relationship to the scriber indicates a vertical path of insertion; a model in a tilted relationship indicates a path of insertion towards the side that is tilted downwards (Fig. 10). The scriber of the surveyor, when projected downwards sufficiently to involve the full length of the crown of a tooth on the model and resting in contact with the tooth, will indicate three zones for that particular area: an undercut or retentive zone gingivally to the point of contact, a supporting zone occlusally to the point of contact, and a neutral zone at the point of contact (Fig. 11).

It is self-evident that while either resilient or rigid portions of a clasp may rest on the supporting zone, only those portions which are resilient should occupy the undercut or retention areas. Whether an area in the retention zone is suitable for engagement can be judged by observing the degree that the surface diverges from the scriber. To be suitable, the distance between the scriber and the area

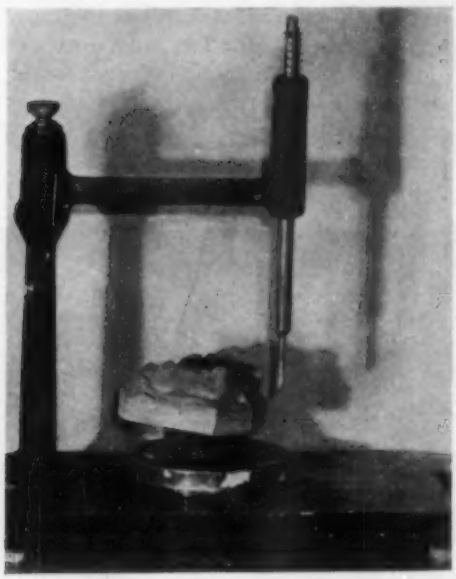


Fig. 9.—Dental surveyor. Relationship of vertical spindle to the model indicates path of insertion being studied. In this case, with model lying horizontally, path of insertion being studied is vertical

Fig. 10.—Model tilted downward posteriorly indicates path of insertion downward and backward (if it was an upper model, upward and backward)

to be occupied must be within the resiliency limits of the clasp-arm. By rotating the model so that other surfaces of the tooth are brought into contact with the scriber, the retention and the supporting zones of these surfaces can be noted. Other teeth to be included in the general design can be studied similarly.

If conditions are found that are not favorable for the particular path of insertion being studied, the conditions produced by a different path of insertion should be observed. To change to a different path of insertion merely entails, as was explained previously, changing the tilted position of the model in its relationship to the vertical scriber (Fig. 12).

Once the path of insertion most favorable for all factors involved has been ascertained, a guide line can be scribed on the surfaces of the teeth by means of the vertical scriber. This guide line will graphically portray the division line separating the retention and the supporting zones. Knowing the location of these zones and the degree of undercut of the retention zone, the operator is in a position to work out the clasp design intelligently. Knowing the clasp design desired, he is in a position to know where the occlusal rest areas should be prepared and whether tooth contours should be modified.

Other things upon which the path of insertion has a bearing and which can be evaluated by means of the dental surveyor are: presence of undercuts in the contours of soft tissues which may complicate the placement of bars, arms of bar-type clasps and saddle flanges; the minimum distance necessary between a lingual bar and the mucosa to provide clearance of the bar as it is being seated past a lingually inclined surface; and the maximum extension of a saddle in an edentulous area so that the proximal surface of an abutment tooth will not interfere with the seating of the saddle.

The dental surveyor is an indispensable instrument for every operator when surveying a mouth before preparation for partial dentures, whether he will do the construction himself or entrust it to a technician. Only by its use can one ascertain mechanical factors upon which success or failure may depend.

Summary

In conclusion it may be stated that the importance of evaluating mouth conditions preparatory to construction of

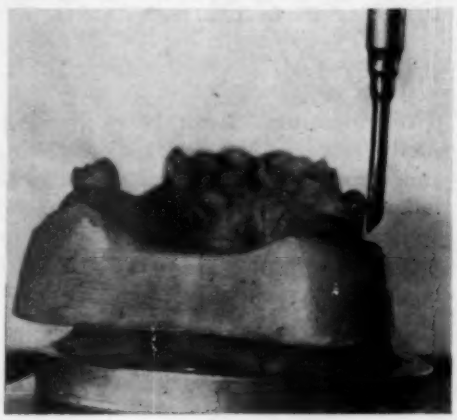


Fig. 11.—Three zones. Neutral zone: point or area where spindle contacts tooth. Retention zone: gingivally to point of contact. Supporting zone: occlusally to point of contact

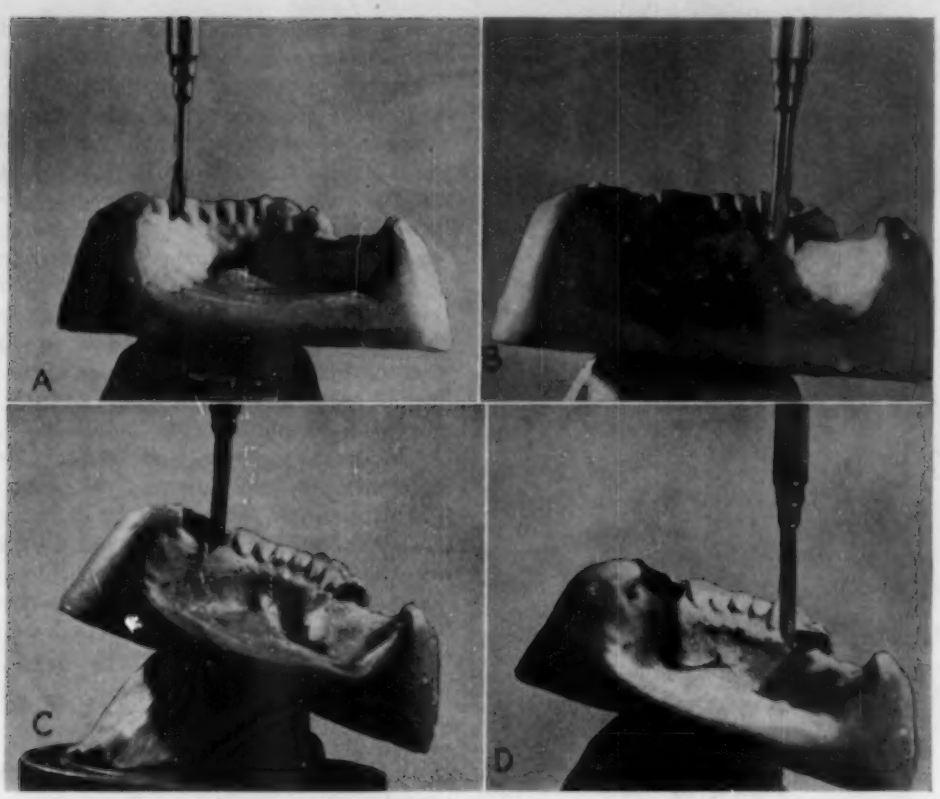


Fig. 12.—With vertical path of insertion, zones as indicated on molar are favorable in A but unfavorable on bicuspid as indicated in B as neutral zone is too close to the occlusal. On changing path of insertion by tilting model dowward on the right, zones on the molar as indicated in C are less favorable and, while improving conditions relative to the bicuspid as indicated in D, the neutral zone is still too close to the occlusal and the lingual surface of the lingual surface of the bicuspid needs reshaping

partial dentures cannot be overemphasized. Oversight of any one of the many and varied factors involved may lead to failure. The operator has at his command several ways—the visual examination, the use of roentgenograms, the study of models by means of a dental surveyor—by which he may acquaint himself about the conditions which are present. In attempting to achieve a successful result and to avoid every chance of failure, the operator owes it to himself and to his patient to employ all the means at his disposal.—*613 E. Court St.*

CONSTRUCTION OF FULL DENTURES

J. C. Tighe, D.D.S., Omaha, Neb.

In offering this discussion on the construction of full dentures, I fully realize that the field has been completely covered over and over again. In spite of all this research, however, there seems to be a great number of general practitioners still searching for a comprehensive technic that will give satisfactory results for both dentist and patient. One need only check the attendance at denture clinics in any part of the country to verify this statement. Since only certain phases of such a large subject can be covered in one paper, this discussion will be concerned with the principles and advantages of the cuspless or flat plane tooth, and with illustrating a simple, efficient manner of its use. Features of the cusp tooth will be discussed for comparison later in this paper.

The flat plane or cuspless tooth is not entirely a new idea. It was presented by Hall[1] in 1930. The cuspless tooth has had its successes and its failures based upon intelligent application. The general idea of its use was, of course, to eliminate functional interference, and that, I believe, was the thought back of most of the denture research for more than a quarter of a century. How many times during those twenty-five years were we told that we now had a tooth with a certain cuspal angle that would surely solve our problems? Who can remember the innumerable adjustable articulators developed during that period, each claiming a complete solution? Just how much has been accomplished by the various cuspal angles and the articulating mechanism is a matter of opinion. Articulators serve a useful purpose, but the mouth is the best articulator and should always be used for the final check.

Established Facts

Here are three pertinent facts which should be considered during the construction of full dentures.

1. The foundation of dentures always will be unstable.
2. The foundation of dentures always will be changeable.
3. The foundation of dentures always will be covered with a layer of saliva, which magnifies the mobility of the base.

It must be remembered, too, that half of the base (the mandible) is movable, and movable in an individual manner.

It is generally agreed that no two people have exactly the same condylar path. Seldom is the movement of the condyle the same on the right and left side of any older person. This is clearly illustrated by the tracings of the gothic arch. Many ignore these facts, however, and recommend that the line of occlusion be a straight horizontal plane, and that all dentures be constructed to that horizontal plane. When the mandible is brought forward in such cases, the teeth may stay in contact; but since the mandible must descend as it comes forward, what happens under the lower denture has never been explained satisfactorily.

The movement of any cusp tooth denture (while in occlusion) whether the teeth are set on a horizontal plane or according to any adjustable articulator, is regulated by, and limited to, the incline planes of the contacting tooth surfaces. It isn't clear to me just why such limitations should be preferred.

1. Hall, Rupert E., The Inverted Cusp Tooth. *J.A.D.A.* 18:2366 (Dec.) 1931.

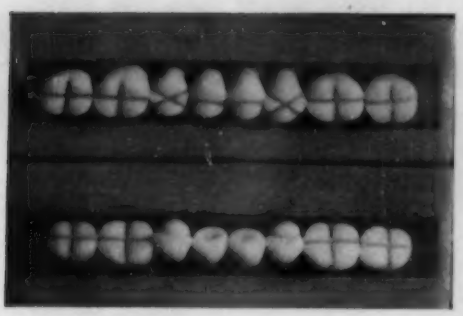


Fig. 1—Flat plane posterior teeth showing simplification of grooves

We are told that our troubles will disappear if our dentures are in balanced occlusion. The term "balanced occlusion" seems to cover a number of different conditions. All operators, regardless of the position or type of occlusal plane, claim to have accomplished balanced occlusion. If having the incline planes of the cusps occlude in unison is balanced occlusion (providing it were possible to obtain the same cuspal angle as the natural path of the condyle in the glenoid fossa) then perhaps they would be somewhat correct. Equalizing the pressure on the various cusps does not remove the cuspal interference, as any force applied at an angle on the facet of a cusp or series of cusps must be transferred to the denture base at a similar angle.

Changeable Foundations

Because of the nature of the foundation upon which dentures are constructed, it would seem more practical to apply the necessary force as nearly as possible at a right angle to that foundation. This is what is attempted when using a cuspless tooth set to an individually established condylar path.

The question is frequently asked, "In what type of case do you consider it necessary or desirable to register a condylar path?" I would answer by saying, "If I were having full dentures constructed for myself I most certainly would want to register a condyle path. Surely, then, there is no good reason why I should not recommend this type of service for all my patients."

As the unavoidable tissue changes take place, readjustment of the occlusal surfaces becomes imperative. It is obvious that a cuspless tooth set to the patient's individual condyle path would be more easily adjusted.

In natural dentition the occlusal surfaces of the teeth change shape because of usage, and while this causes a loss of the vertical dimension, it also helps to maintain a balanced occlusion. With full dentures, the changes taking place and the loss of vertical dimension are caused by natural or unnatural resorption or the destruction of tissue by force, either of which produces an unbalanced condition. Once this tissue is destroyed it is never replaced. It would seem logical to choose the method of denture construction more favorable to its retention. Since I believe the flat plane tooth causes less destruction of tissue, and possesses many other advantages, it is my choice (Fig. 1). The following technic will illustrate the simple, efficient manner of its use. The type of impression material and technic will, of course, be left to each operator.

Technic

Beginning with the completed models, well fitting base plates are the first step. In preparation for the taking of the "bite" it is suggested that a large roll of hard wax be adopted to the upper base plate, extending well below the normal incisal line (Fig. 2, *A*). After forming the general labial and buccal surfaces, the length of teeth is established (incisal line). This incisal line is carried distally, right and left, the entire length of the wax, and should represent the tentative occlusal line. It should parallel Camper's line which is the line from

the nose to the ear. The wax is trimmed to this occlusal line and made flat with a hot instrument (Fig. 2, *B*). A similar roll of softer wax is built up on the lower base plate (Fig. 2, *C*). The occlusal surface of the upper base plate is lubricated and both upper and lower base plates are placed in the mouth. The patient is instructed to close gently and slowly. Since the upper wax is hard and cold, the lower warm wax will be displaced. This procedure is followed until the proper vertical dimension is reached. The excess wax is trimmed away. The gothic arch tracer may be used at this point.

With centric established, the bite rims should be stapled together with flat staples, removed from the mouth and mounted on the articulator. The facebow may be used but it is not necessary. Care should be taken, however, to obtain a good level mounting. After the base plates are mounted the next step is to construct the "chew in" blocks.[2] The original bite wax is removed from the lower base plate except the amount corresponding to the four incisor teeth (Fig. 3, *A*). This wax is replaced with a soft "chew in" wax well above the tentative occlusal plane. The upper bite wax is

2. Meyer, F. S., A New, Simple and Accurate Technic for Obtaining Balanced and Functional Occlusion. *J.A.D.A.* 21:195 (Feb.) 1934.

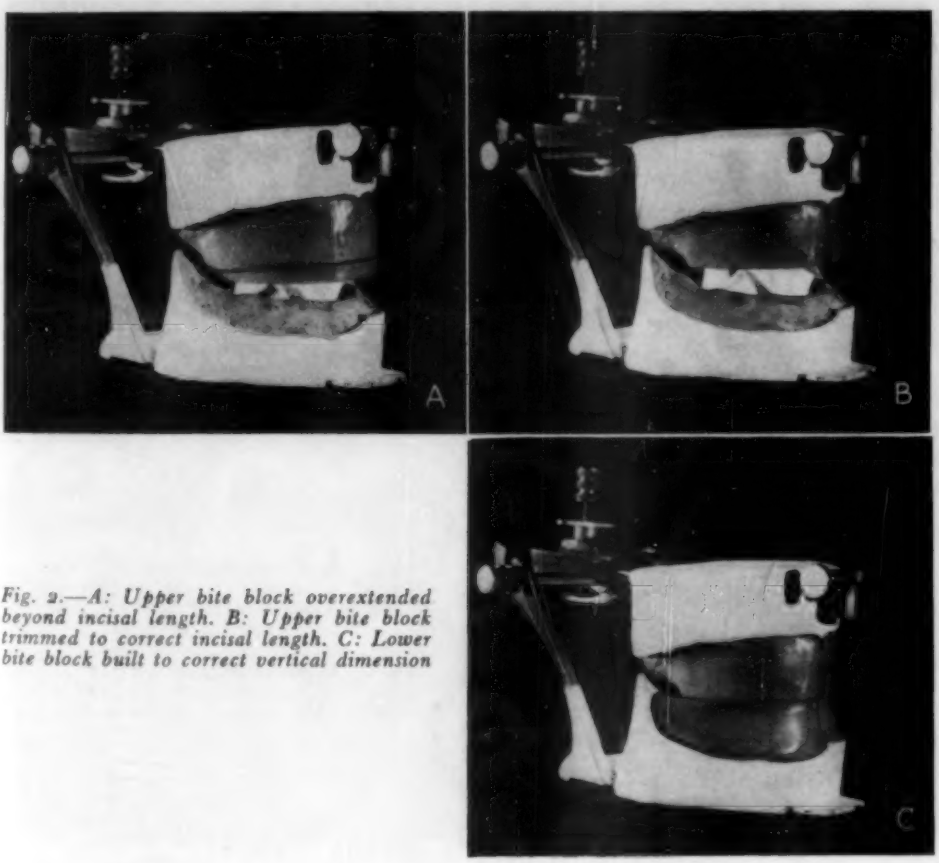


Fig. 2.—A: Upper bite block overextended beyond incisal length. B: Upper bite block trimmed to correct incisal length. C: Lower bite block built to correct vertical dimension

lubricated and the articulator is closed to within 2 mm. (anterior) of the original vertical dimension (Fig. 3, *B*). The bite wax is removed from the upper base plate in the same manner as the lower, all except the amount corresponding to the four incisors. This is replaced with "chew in" wax several millimeters below the original occlusal plane. After chilling the lower "chew in" wax and warming the upper, the articulator is closed to within 4 mm. of the original vertical dimension (Fig. 3, *C*). After removing the excess "chew in" wax, the bite blocks are ready for the "chew in" process in the mouth.

The "chew in" blocks are lubricated with mineral oil and placed in the mouth. The patient is instructed to close the wax blocks together and proceed to chew with a uniform light stroke. The speed with which the "chew in" is accomplished is controlled by the temperature of the wax and the amount of pressure applied. In the beginning the temperature should be slightly more than 100 F. If the wax is allowed to crush down too rapidly it will fail to record the natural path of the condyle. After three or four short efforts, the patient will have brought the two anterior hard waxes together, which brings them back to the original vertical dimension (Fig. 4, *A*).

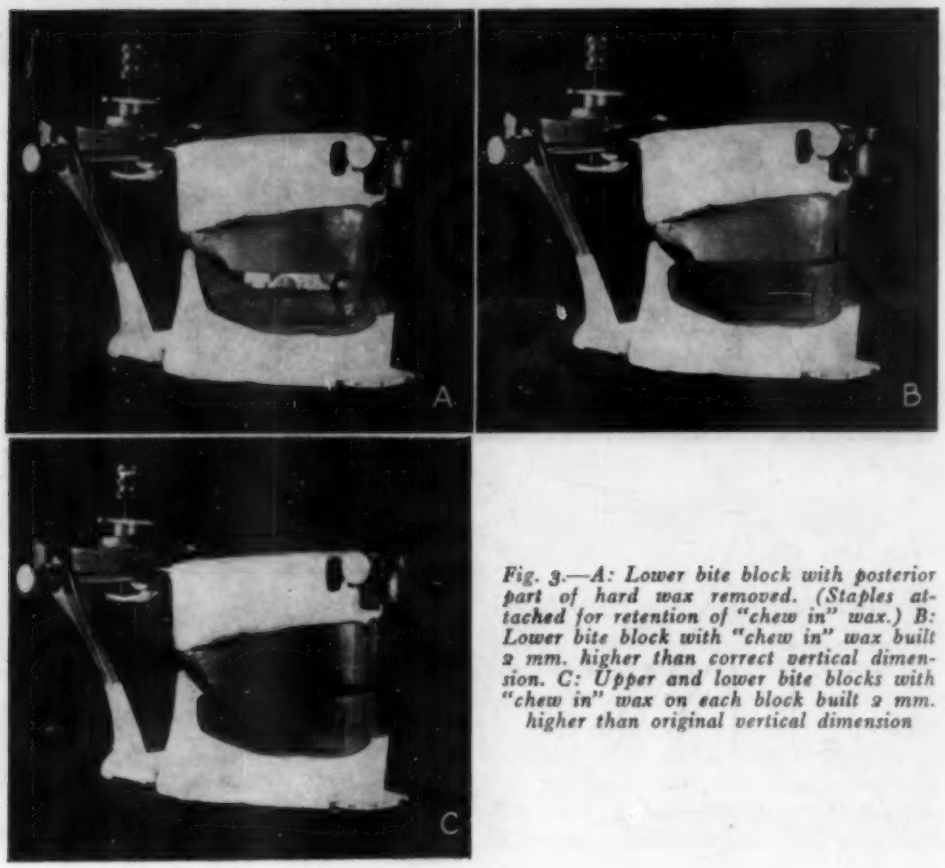
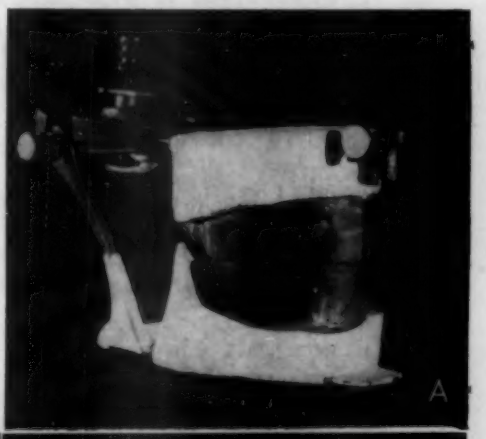
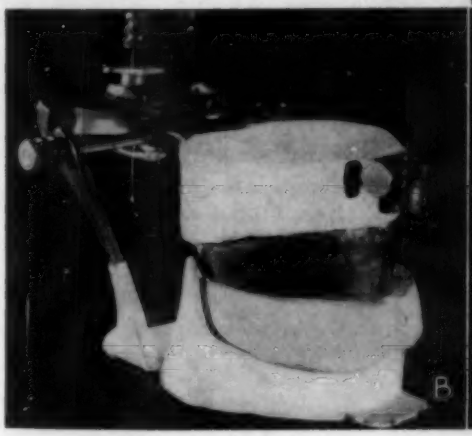


Fig. 3.—A: Lower bite block with posterior part of hard wax removed. (Staples attached for retention of "chew in" wax.) B: Lower bite block with "chew in" wax built 2 mm. higher than correct vertical dimension. C: Upper and lower bite blocks with "chew in" wax on each block built 2 mm. higher than original vertical dimension

It is well to check the centric at the completion of the "chew in" process using the gothic arch tracer if so desired. After removing the mineral oil from the occlusal surfaces of the blocks, they are again stapled together and removed from the mouth. It is necessary to remount either upper or lower cast, and the set pin on the articulator. The lower "chew in" block is now replaced with a new base plate, upon which a plaster platform is to be constructed. A new base plate is fitted to the lower model to which are attached several ordinary staples. Apply soft plaster and close the upper bite block into this soft plaster to the pin setting of the articulator. After the plaster has hardened, trim away excess plaster but leave about a 5 mm. shelf buccally and labially to assist in setting teeth (Fig. 4, *B*). The upper teeth are set up against the lower plaster platform (Fig. 4, *C*). The plaster platform is now replaced by the original base plate and the lower teeth are set to the upper teeth. The lower anteriors are set up first according to the esthetics, phonetics and mechanics of the case. The posterior teeth are set up according to the remaining space. Since there is no interdigitating of cusps in flat plane teeth, their anteroposterior position is selective. Bicuspids and molars may be interchanged, and in extreme cases one





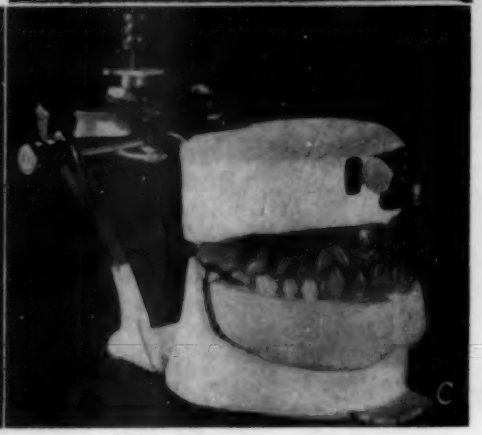


Fig. 4.—A: Bite blocks chewed down to the original vertical dimension. B: Lower plaster "set up" platform formed from upper "chew in" plane. (Articulator pin removed for photography.) C: Upper teeth set to lower plaster "set up" platform. (Articulator pin removed for photography)

tooth or more may be left out or may be added.

All cusp teeth are made to interdigitate and, therefore, must be set in a certain position as related to an opposing tooth or teeth. The trouble brought about by this interlocking of cusps is causing greater and greater demands for the shallow cusp or flat plane tooth.

Comments

The following are some of the advantages claimed for the flat plane tooth.

1. Eliminates the greatest amount of interference.
2. Finished cases are much more easily adjusted.
3. They are more easily set up since they do not interdigitate, and, therefore, no certain tooth is required to occupy a certain position.
4. The same masticating efficiency is obtained without cuspal interference.
5. Dentures made with flat plane teeth are much more easily relined.—*2890 Bauman Avenue.*

REVERSIBLE HYDROCOLLOID IMPRESSION MATERIAL: ITS TREATMENT AND USE IN OPERATIVE AND PROSTHETIC DENTISTRY

Morris J. Thompson, D.D.S., Beverly Hills

IMPRESSIONS of reversible hydrocolloid and stone[1] models are now the materials of choice for accurate and dependable reproduction in indirect restorative procedures. Inlays, fixed bridges, partial dentures and full mouth reconstruction can be made indirectly on stone models with a greater degree of precision than has been achieved with other materials and technics. In the past ten years the use of this method, with adequate equipment and a better understanding of the characteristics of the materials, has resulted in the development of a standard procedure for obtaining consistent and accurate results.

The hydrocolloid impression technic in the construction of inlays and bridges was first reported in March 1937 by Sears.[2] My efforts were directed toward broadening the field to include bridges, partial dentures, and full mouth reconstruction, by the indirect method and using a master model supplemented with individual dies.

Upon proving to my satisfaction that a casting could be made to fit a stone die and a prepared tooth in a like manner, and many other dies as accurately, I discarded the "water pan and thermometer" technic as being inadequate and proceeded to construct and develop a heating unit and the necessary accessories to provide a technic which would give accurate and consistent results.

Read before the Section on Partial Denture Prosthesis, eighty-ninth session of the American Dental Association, Chicago, September 14, 1948.

1. The term "stone" is used throughout this article to denote a hard gypsum dental plaster.

2. Sears, A. W. Hydrocolloidal Impression Technique for Inlays and Fixed Bridges. *D. Digest* 43:230 (May) 1937.

Composition and Characteristics

Reversible (or agar) hydrocolloid is approximately 80 per cent water, 15 per cent agar-agar and 5 per cent thermoplastics, inert materials, chemicals, plasticizers, antiseptics, color and flavor.

Reversible hydrocolloid is a practical impression material and its use is becoming accepted universally as it is easily liquefied and gelled with the ordinary facilities of a dental office. It is liquefied by heating, usually in water at or near boiling point, and it is gelled or solidified by cooling with tap water at room temperature. The uncertainty of the agar ingredient necessitates liquefying at not less than 208° F. and, while solidification may be accomplished at mouth temperature if sufficient time is allowed, tap water generally is used at a temperature of 72° F. A small tray of material requires continuous application of water for approximately five minutes, while a larger mass needs a longer period to complete gelation adjacent to the warm tissue.

Experience has shown that hydrocolloid assumes a firmness, or "body," as its temperature is decreased. After the material is liquefied, it may be maintained in the fluid state at temperatures as low as 138° F. for use during the day (Fig. 1). If a storage temperature of 138° F. is used, the material will develop a body more likely to hold its position in the tray.

Preparatory to taking an impression, the temperature of the stored material should be reduced still further, not only for the comfort of the patient, but to provide a still firmer body for retention of position in the mouth.

Through experience and results of tests, it has been found that if the hydrocolloid material is left in water at 113° F. for at least 10 minutes, it will develop a body of even temperature and consistency throughout. Although the temperature of the hydrocolloid and the water become equal in 6 minutes (Fig. 2), it is necessary to retain the material in the bath for an additional period in order to develop the desired firmness.

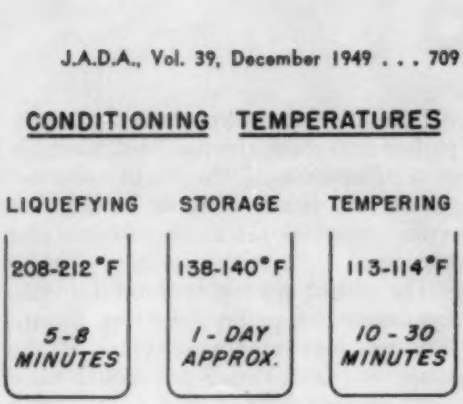


Fig. 1.—The storage temperature of hydrocolloid should be as low as possible and yet high enough to maintain the material sufficiently fluid for extruding from the package or the syringe. The tempering bath should: (1) produce a firmness for a detailed impression; (2) produce the same temperature and consistency throughout for an even flow; (3) have a definite period for conditioning, in minutes, which provides a known working range

In spite of the fact that most hydrocolloid materials on the market respond similarly to time and temperature, it will be advisable for the operator to acquaint himself with the characteristics of each product. For instance one material, when conditioned at a given time and temperaature, may be lacking in body and have a tendency to flatten out in the tray; whereas another material, of a different formula, will maintain its position in the tray with little change. An acceptable material is one which flows easily and yet has sufficient body. A material which is too rigid fails to flow readily into the crevices and angulations unless confined and compressed. The accuracy of detail of an impression is improved materially by injecting into the cavity area undiluted hydrocolloid of a fluidity obtained at a conditioning temperature of 138° F. The heat is not uncomfortable because 10 to 15 degrees (F.) is lost as the material is extruded from the needle. As the tray

of conditioned hydrocolloid is slowly pushed into place, the two fluid materials of a different consistency will bond together, the heavy material forcing the syringe material into the angulations and crevices.

The colloid materials exhibit a shrinkage during the gel process which is compensated for by the expansion of the stone used for pouring the model. Care must be exercised in the selection of a gypsum plaster which has the correct setting expansion.

Experimental Tests

Five hundred and twenty-three tests were made, and the results recorded, for the purpose of determining factors affecting accuracy in the combined use of hydrocolloid impression material and stone models.

The method of making the tests was comparable to the technic at the dental chair and in the laboratory. The apparatus consisted of the following (Fig. 3): (1) an invar metal peg, ⅜ inch in diameter, mounted on a brass base containing a water-circulating system; (2) several small water-cooled trays; (3) a dial indicator calibrated in ten-thousandths of an inch; (4) a machinists' micrometer calibrated in ten-thousandths of an inch; (5) thermostatically controlled storage and tempering baths.

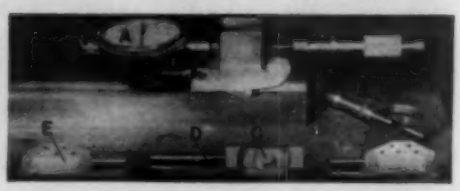


Fig. 3.—Equipment for making the tests. A, dial indicator, B, machinist's micrometer; C, 3/9" invar peg; D, water circulating system; E, water cooled inlay tray

Effect of the Temperature and Tempering Period on the Accuracy of the Stone Model.—In this project 122 impressions and corresponding stone models were made. The models were poured immediately using a standard dental stone with a hygroscopic expansion of 0.0028 inch per inch. After setting, the models were separated from the impression, measured in two directions and the results recorded. Impressions were taken with undiluted hydrocolloid ranging between 100° and 200° F. in temperature. A few impressions were made with the material at a temperature of 200° F. In this test, the material was poured over the die which was seated in a matrix; the other impressions were made by injecting hydrocolloid around the die, placing a tray of tempered hydrocolloid over the mass and then chilling it with tap water (Fig. 4). The temperatures used for tempering were 100°, 102°, 110°, 113°, 125°, and 128° F.; and the periods of tempering ranged from 3 minutes, for the low temperatures, to 50 minutes for the temperature of 125° F.

The tests revealed that the most practical temperature for storing hydrocolloid should be between 138° and 150° F. Although the higher temperature of

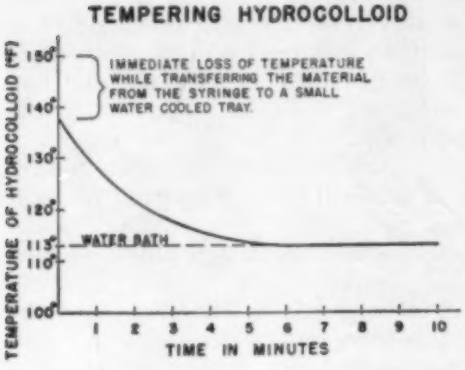


Fig. 2.—The temperature of the hydrocolloid reaches the temperature of the water bath of 113° F. in six minutes. The desired firmness is obtained by allowing the material to remain longer

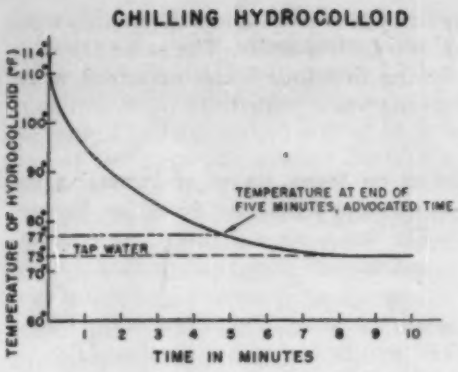


Fig. 4.—Temperature of hydrocolloid after chilling with tap water

150° F. retained the material in a more fluid condition, which permitted its flow from the syringes with less hand pressure, the heat was more noticeable. Therefore a temperature closer to 138° F. should be more comfortable for both patient and operator.

In a series of 25 tests (Table 1), in which a bath of 113° F. was used for conditioning the hydrocolloid for periods of 5, 10, 15, 20 and 30 minutes, it was found that the maximum error was 0.0014 inch. The average for the plus error was 0.00035 inch and the minus discrepancy was 0.00035 inch for the duplicated ⅜ inch metal peg.

Although conditioning for only five minutes at 113° F. resulted in a dimensional size comparable to that of other tests, it did not provide the viscosity or firmness required for a sharp impression.

Several tests were made with the material conditioned for three minutes in a tempering bath at 102° F. The results were approximately the average of other tests (Table 2). The temperature at the end of three minutes was 107° to 108° F. (Fig. 5).

Effect on Stone Model of Chilling Impressions with Cold Water 42° F.—Nine impressions were made after tempering for 15 minutes at 113° F. and covering the die with hydrocolloid by injection with a small syringe. The impressions were chilled with cold water at 42° F. (Fig. 6) for three minutes and then poured with a vacuum mixed stone from which the excess water had been removed with a linen towel. The measurements of the stone models approximated the tolerance found with those tests in which chilling was done with tap water at 73° F. (Table 1).

Effect on Stone Model of Immersing Impressions in Tap Water.—A test was made to determine the amount of dimensional change caused by immersing the impressions in tap water for various periods. Five impressions were taken of the ⅜-inch metal peg, cooled by circulating tap water through the tray and poured immediately with a vacuum mixed standard stone. The poured impressions were placed in water, and at the end of 30 minutes the five models were removed and measured in two directions. These first models were used as controls for size. The impressions were replaced in a tap-water bath at room temperature and

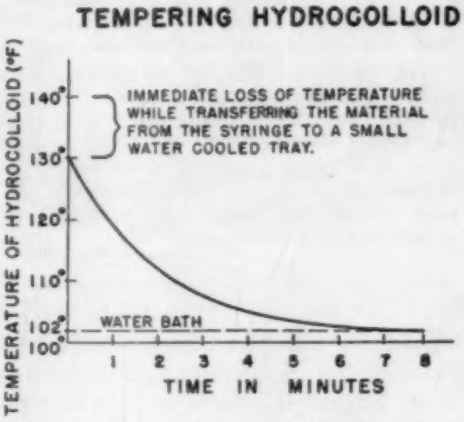


Fig. 5.—The advocated period for tempering with a water bath of 102° F. is three minutes. The material is 107° F. at the end of this period

Table 1.—Effect of tempering time on the accuracy of the stone model

Minutes in tempering bath	Error in Stone Model	
	Parallel to flanges of tray (inch)	At right angles to tray (inch)
5	+0.0006	0.0000
	+0.0003	0.0000
	0.0000	+0.0002
	+0.0010	−0.0002
	0.0000	+0.0001
10	−0.0001	−0.0001
	0.0000	+0.0004
	−0.0001	−0.0002
	+0.0006	+0.0003
	+0.0002	+0.0002
15	+0.0004	+0.0005
	+0.0001	−0.0008
	0.0000	+0.0005
	+0.0002	0.0000
	−0.0004	−0.0002
20	+0.0005	−0.0003
	0.0000	+0.0002
	0.0000	−0.0002
	0.0000	−0.0007
	−0.0002	+0.0004
30	−0.0014	+0.0004
	0.0000	+0.0002
	−0.0005	+0.0002
	−0.0001	−0.0002
	−0.0002	−0.0002

Tests were made with one hydrocolloid material which had been stored at 150° F. Impressions were made with a small inlay tray and chilled with tap water 73° F. All impressions were poured with a stone having a hygroscopic expansion of 0.0028 inch per inch. Poured impressions were immersed in potassium sulfate solution.

soaked for two hours before being repoured. This procedure was repeated for other immersion periods of 4, 22 and 46 hours (Fig. 7).

The averages computed from the five tests revealed that the hydrocolloid produced undersized models the first four hours, but after 46 hours the models were 0.0006 inch oversize. The same trend as for the first four hours appeared when the test was repeated.

Effect on Stone Model of Immersing Impressions in 2 per cent Potassium Sulfate. —The same general procedure was followed as with water except that the impressions were immersed in a 2 per cent solution of potassium sulfate in tap water. The results were rather startling (Fig. 7) inasmuch as all of the resultant models were smaller than the originals.

This test was followed by another using distilled water and the same percentage of potassium sulfate. The results were very similar to those from the tap-water solution.

With tests on two other manufactured products, however, it was found that one material produced a model larger than the original, and the other produced a model very close in size to the original, within the same period of time.

Another observation was that the stone models, poured successively in the same impressions after immersion in water for varying periods of time, were more elliptical than the original.

Since the tests have shown that the models made from hydrocolloid impressions immersed in water or in a 2 per cent solution of potassium sulfate are not dependable, the impression should be poured as soon as possible after it is obtained. This procedure should be followed until a method for preserving the impression has been developed which will produce a model the size of the original.

Potassium sulfate does accelerate the setting time of the stone poured into the impression, and seems to be indicated for this reason. Furthermore, models which are allowed to harden in potassium sulfate seem to have a smoother and harder surface than those allowed to harden in water.

Expansion of Stone During Setting.—Six gypsum stones were tested for expansion under the following treatment: (1) hand mix, (2) mechanical spatulation under vacuum, (3) hygroscopic setting expansion in water or potassium sulfate, (4) nonhygroscopic setting expansion in air. The expansion was tested by placing the mixture in a loosely assembled metal box, 1-inch square, held together with a rubber band. The measurement was made with a dial indicator calibrated in ten-thousandths of an inch (Fig. 3).

With the exception of the special die stone, "Diolite" (Table 3), tests for nonhygroscopic setting expansion (Fig. 8) showed little difference in expansion between stone mixed by hand and by mechanical spatulation under vacuum. Spatulation of the Diolite under vacuum showed 0.0005 inch more expansion than when the stone was mixed by hand.

Results on the hygroscopic expansion of the stones showed an increase over the nonhygroscopic setting expansion. The stone used exclusively throughout the tests showed an average increase of one thousandth of an inch when compared to its nonhygroscopic setting expansion. The special die stone showed an increase of .0014 inch over its nonhygroscopic setting expansion. This increase is far more than necessary to compensate for the shrinkage of the hydrocolloid impression material.

Table 2.—The effect of storage and tempering temperatures on the accuracy of the stone model

Test no.	Number of trials	Storage temperature (°F)	Tempering temperature (°F)	Average error (inch)
1	4	138	113	0.0005
2	5	138	113	0.0004
3	3	138	113	0.0009
4	1	152	128	0.0000
5	4	155	125	0.0002
6	3	155	125	0.0006
7	5	155	125	0.0010
8	5	155	125	0.0007
9	1	155	125	0.0000
10	1	155	125	0.0000
11	11	150	113	0.0004
12	3	150	113	0.0003
13	25	150	113	0.0004
14	4	150	113	0.0005
15	2	150	113	0.0004
16	4	150	113	0.0004
17	5	138	113	0.0006
18	5	150	102	0.0006
19	1	150	102	0.0000
20	5	138	102	0.0006
21	5	138	102	0.0008
22	5	138	102	0.0003
23	15	150	113	0.0003

All tests were made with Deelastic with the exception of tests 14 and 15, which were made with CoeLoid 66, and test 22 which was made with a special formula. All impressions were chilled with tap water (73° F.) with the exception of tests 16 and 17 which were chilled with cold water (42° F.). In test 18, the actual temperature at 3 minutes was 107-108° F. (Fig. 2). All models were poured immediately with Albastone (hygroscopic expansion 0.0028 inch per inch). Test 23 was allowed to harden in air (or nonhygroscopically). Tests were made of reproductions in stone of a metal peg (Invar) 0.375 inch in diameter. The hydrocolloid material was injected in all tests with the exception of 1 to 7 inclusive.

Bridges and Partial Dentures

The Fixed Bridge.—Another test of the combined accuracy of the regular stone and hydrocolloid is the success that many have obtained in the construction of the fixed bridge. The fixed bridge has been constructed for years with confidence and precision from well articulated master stone models supplemented with individual dies. In this procedure the operator, in most cases, is required to take only two impressions, the upper and the lower. There is no need to obtain additional impressions for individual dies, as the full impression may be poured twice. The cavity areas are poured first and on the set of the stone, the die or dies are removed from the elastic hydrocolloid and the second pour is made for the assembly model. This exact duplication of the

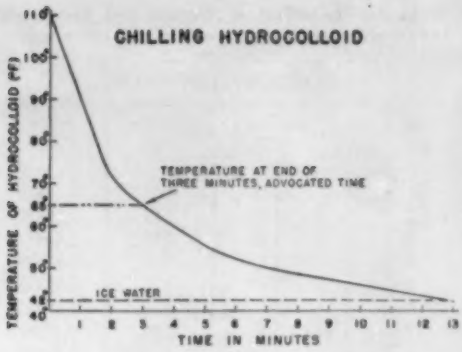


Fig. 6.—Temperature of hydrocolloid after chilling with ice water

dentition and prepared cavities enables the operator to construct and finish a bridge which, except for minor adjustments, will be ready for insertion at the patient's second visit. This two-visit procedure not only saves the busy operator and uneasy patient time, but the process is much less tedious and relatively comfortable for the patient.

The exact copy (Fig. 9a) of the tooth cavity in the single die and in the master model simplifies the forming of the wax pattern. The pattern may be shaped up on the individual die and transferred to and from the articulated model, obtaining occlusal correction by "spotting in" with the aid of talcum powder. The general contour, grooves and ridges may be carved, resembling the remaining natural teeth. In the wax-up, stone provides an acceptable material against which to mold and trim the paper-like margins, as it does not chill the pattern as readily as metal.

Following the precision casting of the abutments with margins of a needle point sharpness, the inlays are placed in their respective teeth on the master model and the bridge is completed in the usual manner (Fig. 9b).

A stress-breaker incorporated in the structure of a fixed bridge permits some advantages over the all-soldered bridge. Broken stress may be described as a hinge or some means by which the stress, strain, or torque is relieved on an abutment tooth. The relief of strain on the abutment inlay will allow the operator to prepare the cavity with less tooth destruction and visibility of gold, especially on the upper bicuspids and cuspids. The stress-breaker designed with an internal stud, or pin, projecting from the pontic into a well of the abutment inlay, not only supports the occluding forces, but prevents the whip action which frequently develops from the pull of sticky foods in chewing.

The advantage of a pontic of plastic and gold is that the metal occluding surface protects the plastic from water. When the limitations of methyl methacrylate material are fully understood, and when the material is cured properly and used judiciously, it fills an important role in the esthetics and cleanliness of a fixed bridge.

Dowel-Rest Stress-Breaking Attachments for Partial Denture.—Through necessity, in 1931, I made the first dowel-rest stress-breaking partial denture of the distal extension type. The requirements of the particular case were such that the accepted internal attachments with the stress-breaking feature could not be

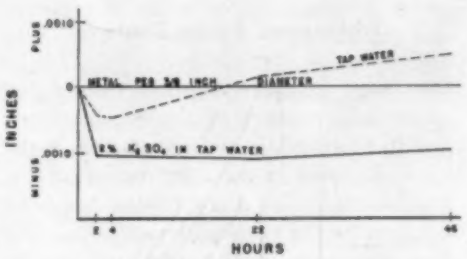


Fig. 7.—The curve represents the dimensions of the stone models obtained after immersing hydrocolloid impressions in (1) tap water and (2) a solution of 2% K_2SO_4 made with tap water

used. The patient's ease of insertion and removal, and the general feel and comfort of the restoration were very gratifying. This response, along with the chewing efficiency and the simplicity of construction with the aid of hydrocolloid and stone models, was an incentive for me to apply the feature to mesial and unilateral partial dentures.

The dowel-rest attachment (Fig. 10) is comprised of a half clasp having a spring which is developed by slitting the palatal or lingual bar to the desired depth with a fine gold saw, a deep notch in the abutment inlay (Fig. 11a) with a well to receive a pin or dowel extending below the floor of the notch (Fig. 11b), a lug of gold (Fig. 11c) for a rest projecting from the gold partial denture, and a pin extending below the rest. An important feature in this design is a dimple-like recess which is placed on the lingual surface of the abutment inlay or crown (Fig. 11b) in line with the well and at a level with the floor of the notch. Opposite this recess, and on the under side of the clasp, is a ball projection which fits the recess when pushed to place in a snap-like action.

The retentive feature of this attachment is not dependent on the snap clasp, but on the friction of the lug-rest and locking effect of the dowel when the distal end of the saddle is displaced occlusally (Fig. 11c). The stress-breaking effect which allows the appliance to move with the tissue in mastication is developed by grinding the dowel on the pulpal side (Fig. 11d).

The mesial extension partial denture replacing anterior teeth (Fig. 12) pre-

Table 3.—Expansion of stone mixed by hand and by mechanical spatulation under vacuum

Stone	Nonhygroscopic		Hygroscopic	
	Hand	Vacuum	Hand	Vacuum
	(inch)	(inch)	(inch)	(inch)
Albastone	0.0018	0.0018	0.0022	0.0028
Greyrock	0.0017	0.0015	0.0024	0.0026
Denprocal	0.0020	0.0020	0.0025	0.0029
Castone	0.0016	0.0017	0.0022	0.0025
Coecal	0.0020	0.0020	0.0021	0.0023
Diolite	0.0023	0.0028	0.0037	0.0042

Each figure represents the average expansion per inch computed from three tests. Measurements were made with dial indicator. The hand mixed stone was stiffened by the gradual addition of powder. The vacuum mixed stone was mechanically spatulated for ten seconds under vacuum and the excess moisture removed by compressing in a linen towel until a putty consistency was obtained. In the hygroscopic tests, the poured impressions were immediately placed in a solution of potassium sulfate in water.

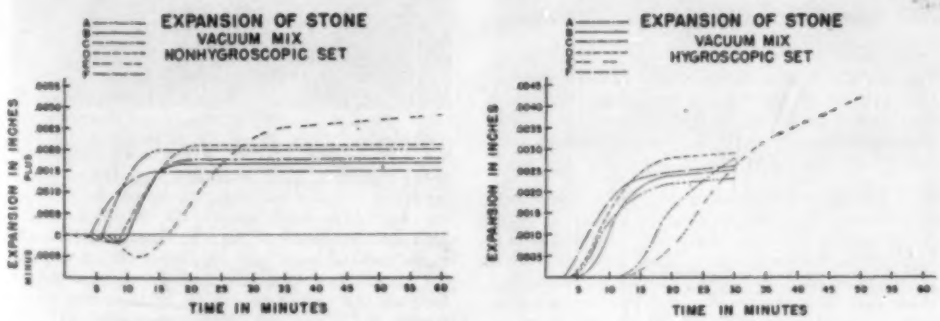


Fig. 8.—The expansion per inch with (left) nonhygroscopic and (right) hygroscopic set of Albastone (A), *Castone* (B), *Coecel* (C), *Denprocal* (D), *Diolite* (E), *and Greyrock* (F).

sents a better esthetic appearance than the fixed bridge. The tooth or teeth are made without gold, the metal for suspending and maintaining the denture in place is out of sight, and the attachments are anchored to the posterior teeth. Molding the teeth, preferably in plastic, permits placement of the contact for position, size and shape, thereby presenting the most natural effect. The fully contoured tooth, moreover, will allow for the establishment of a normal interproximal space, and the restoration of the full contour of the ridge tissue with gum-colored plastic will not only restore facial expression by supporting the lip, but will have a very acceptable effect when the patient smiles.

Another feature in stress-breaking which is fundamentally correct and is used with bilateral partial dentures, was designed by myself and made for a patient in 1927.[3] It is included here to show that the combined accuracy of hydrocolloid and stone makes possible the pro-

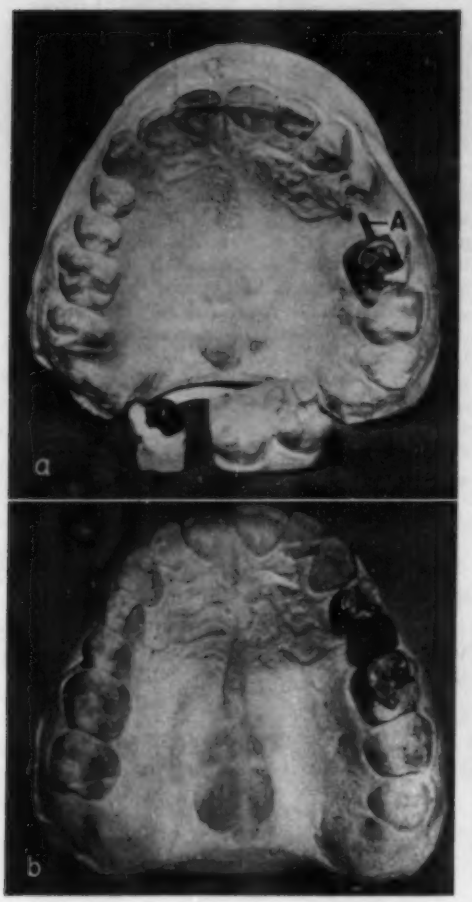


Fig. 9.—a. The accurate stone models permit the transfer of patterns to and from the cavity dies and master model for occlusal correction and anatomic contour. A, one-half round wax bar which is converted into gold with the inlay

b. The inlay abutments on their respective stone teeth. The pontic has been shaped up in inlay wax around the cast bar which projects into the edentulous space. The waxed-up pontic is invested with the inlay abutment and then cast directly to the half round bar. The joint is reinforced with solder. In this particular construction the articulation is perfected with the aid of talcum powder and space is created for the plastic facing

3. Lufkin, A. W., *History of Dentistry*, ed. 1, Philadelphia; Lea & Febiger, 1938, p. 235.

Fig. 10.—The distal extension dowel-rest stress-breaking gold skeleton developed on a typodont for clinical demonstration. A, stabilizing bar (one-half clasp); B, lug-rest which fits into the notch, F, of the abutment; C, slit made with a gold saw to provide a spring for the stabilizing bar. D, ball-projection which fits into the round recess, H, of the inlay abutment. E, Dowel which fist into the well, G, of the abutment. F, notch into which lug-rest fits; G, well into which dowel fits; H, round recess into which ball-projection fits

vision of models on which to construct precision removable bridges. This restoration (Fig. 13) is a lower partial denture involving a free end saddle on one side and a tooth-bearing removable bridge on the opposite side. To avoid a tilting caused by the downward movement of the saddle in chewing around a diagonal axis set up by two of the abutments, one on each side, a buccolingual stress-breaking device was placed in the bridge on the tooth-bearing side. The stress-breaker is made of a rectangular tube and bar extending buccolingually in the pontic tooth. This bar is continuous with a part of the lingual bar. It is relieved on two surfaces to permit the movement of the free end saddle on the opposite side. The rectangular bar is held in place by a pin inserted from the occlusal surface and is secured in position with hammered gold foil. The first restoration was constructed with an additional feature. Since it was assumed that the weight of the saddle would tend to cause resorption of the ridge tissue, a spring wire was arranged in conjunction with the stress-breaker in order to suspend the saddle and relieve the constant pressure.

Complete Mouth Reconstruction.—Reversible hydrocolloid has been especially welcomed by men who concentrate their efforts on reconstructing mouths. After recognizing the accuracy of hydrocolloid and stone models, I proceeded to make up a splint (Fig. 14a) which would stabilize a tracing device assembly and fit both stone model and mouth with the same degree of accuracy. The splint, which rests on the prepared cavities and stabilizes the tracing device and face bow, is cast of metal and is made with a center bearing screw set to maintain the predetermined vertical opening. It is centrally located to prevent the instrument from tilting when taking the registration under biting pressure. The mandibular

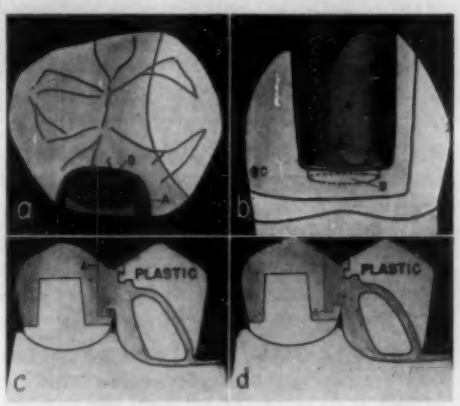


Fig. 11.—Dowel attachment. **a.** *The female part of the dowel attachment is part of the gold casting.* A, *notch in the inlay abutment;* B, *well for the dowel of the male attachment*

b. *Distal view of the female part of the dowel attachment in the abutment casting.* A, *notch for reception of lug-rest;* B, *well for reception of dowel of male part;* C, *dimple-like recess for reception of ball projection from inside of the snap-clasp*

c. *The restoration is held in place by the retentive features of the snap-clasp, the friction of the lug-rest at* A *and the dowel,* C, *at* B

d. *The dowel is ground and polished on the pulpal side at* A, *to allow for the movement of the saddle on the resilient tissue without a strain on the abutment tooth*

Fig. 12.—Mesial extension partial denture showing the replacement of two central incisors and the patient's left two bicuspids

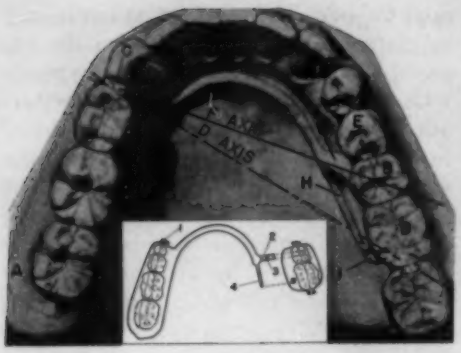


Fig. 13.—Method of correcting a strain on the supporting structures of an abutment by means of a combination of two stress-breakers. A, *free end saddle of the bilateral partial denture;* B, *tooth bearing side;* C, *distal extension stress-breaker;* D, *axis about which the denture tilts when pressure is brought to bear on the free end saddle, introducing a strain on the second bicuspid at* E; F, *axis about which the free end saddle rocks when an additional stress-breaker is inserted at* G; G, *site for additional stress-breaker;* H, *18-gage spring wire used for relieving the continuous pressure on the soft tissue under the free end saddle;* J, *loop for holding the spring wire. Insert shows buccolingual stress-breaker disassembled.* 1, *internal precision attachment with distal extension stress-breaking feature;* 2, *rectangular bar which fits into a sleeve located in the bicuspid of the bridge;* 3, *recess made to receive a pin which holds the rectangular bar in the sleeve;* 4, *18-gage spring wire used for relieving the continuous pressure on the soft tissue under the free end saddle*

tracer, of a dual type (Fig. 14b), is made with the generally accepted stylus and glass tracing table. Projecting forward from the stylus and tracing table and in front of the cross bars is a mechanism for check-biting the four basic positions of the mandible. This consists of a shallow tray for inlay wax on the lower bar and a sleeve on the upper member to receive a check-bite pin. Each pin is labeled right and left and made up in four designated pairs, and each has a ball stop which may be locked with a thumbscrew. This permits their removal and reassembly, when setting the articulator, without a loss of the vertical height. After check-biting the mandibular positions of the patient, the pins are laid aside and again repositioned for setting the articulator after orientation of the restoration. Prior to placing the pins through the sleeve and into the wax, the points are heated over a flame. To simplify an involved procedure I worked out an adjustable face bow and horizontal bar attachment to orient the restoration in the articulator (Fig. 14c). The face bow establishes the casts in the articulator in two dimensions while the horizontal bar orients them in the third dimension and gives an inclination (Fig. 14d) to the models comparable to the arch position in the mouth.

After setting the articulator with the aid of the check-bite pins and mandibular tracings, the case is completely waxed up and coordinated to provide an architectural model[4] (Fig. 14e). Each restoration is balanced and given its anatomical form, position, and alignment (Fig. 14f). Cuspal planes are synchronized with the right and left condylar inclination, lateral shift, and rotation center provided by the previously set articulator. If the first wax-up does not provide an acceptable occlusal tooth form and intercuspation, the wax modeling procedure permits repositioning to resemble more closely the natural dentition.

Although the ideal may not be achieved, a reciprocal relationship can be obtained which will prolong the life of the teeth and establish normal masticatory function (Fig. 14g).

Upon completion of the architectural model the wax patterns for inlay restorations are removed from the master stone model and placed on the supplemental dies for contour and marginal perfections (Fig. 14h). Using a technical procedure (Fig. 14k) the waxed-up coordinated restoration is converted into hard materials with very little trouble consider-

4. Thompson, M. J., The Restoration of an Impaired Masticatory Apparatus to Cuspal Coordination. *Pacific Dent. Gaz.* 37:114 (July) 1929.

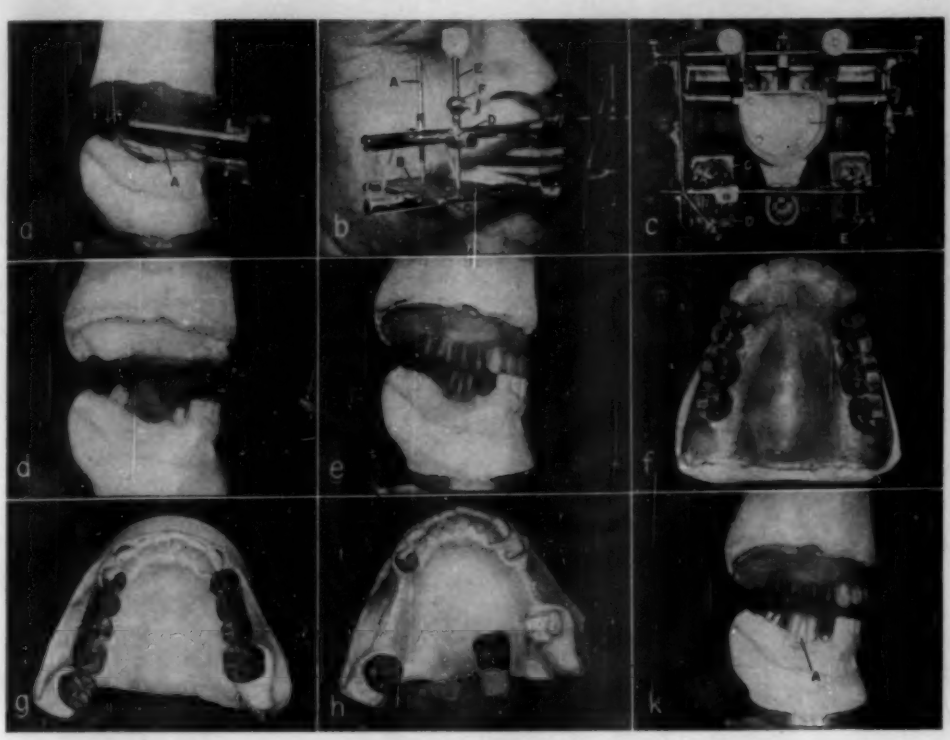


Fig. 14.—The use of hydrocolloid in complete mouth rehabilitation. This reconstruction required a full maxillary denture and a toothbearing mandibular partial denture

a. *Center-bearing screw,* A, *set in the lower metal casting.*

b. *The dual type mandibular tracer is made with a stylus,* A, *and glass tracing table,* B. *Projecting forward from the crossbars is a mechanism for check-biting the four positions of the mandible;* C, *shallow tray for inlay wax;* D, *a sleeve on the upper cross bar member which receives the check-bite pin.* E, *each pair of check-bite pins is labeled right and left and marked centric, right, left and protrusive bite. Each pin has a stop and a lock-screw;* F, *upon recording the vertical distance by locking the stop, the pin may be removed and then repositioned when setting and adjusting the articulator.*

c. *The adjustable face bow orients the mandibular model in two dimensions: it centers the model, and it projects the models forward from the condylar axis. The maxillary model is oriented after the styli of the tracing device are placed in the apex of the two tracings (out of the mouth and without the aid of the patient) and the model is luted to the bow of the articulator.* A, *adjustable arm to the face bow;* B, *horizontal bar which is placed parallel to the table plane;* C, *tracing;* D, *tray of inlay wax;* E, *check-bite pin to register the basic positions of the mandible;* F, *"split-cast" metal plate imbedded in maxillary model. The upper bow of the articulator has been removed to facilitate mounting of the mandibular model.*

d. *The horizontal bar has oriented the models in the third dimension (vertical). The models are given the same tilt as the arches maintain in the mouth.*

e. *Restoration developed in inlay wax to provide an architectural model.*

f. *The flat cuspal planes have been coordinated and synchronized with the movements of the mandible established by the articular. The teeth have been given anatomical form, contour and alignment.*

g. *Showing that coordination may be obtained even though the ideal tooth form and size is not secured. Coordination has been obtained.*

h. *After coordination of the full complement of wax teeth, the abutment patterns have been sculptured to simulate the natural tooth, the margins perfected, and the patterns converted into gold.*

k. *To provide metal against which to grind and balance the maxillary porcelain teeth, the wax coordinated teeth for the edentulous spaces have been converted into a soft metal,* A, *after the abutments were cast in gold.*

ing the extent and complexity of the case.

Conclusions

1. Reversible hydrocolloid is a practical impression material and accurate when its limitations are known and it is used judiciously.

2. Impressions poured immediately with stones having a hygroscopic expansion of .0023 to .0028 inch will produce models sufficiently accurate on which to construct dental restorations that will fit the mouth and the models in a like manner.

3. Restorations, from the small bridge to the complex full mouth reconstruction, may be made indirectly with less chair time for the patient and dentist.

4. Prosthetic appliances constructed in the laboratory are less tedious for the dentist and more satisfactory for the patient.—*409 North Camden Drive.*

▲

Payroll.—At January's end, according to the New York Times, the Civil Service Commission reckoned the employees of the executive department of the federal Government at 2,094,777. The figure represents a gain during the year of 90,803—a gain that may be counted largely as a loss to the taxpayer.

Government's busy civilian workers are distributed somewhat as follows: 75,000 in the three military departments; 500,000 in the post office; 200,000 in the Veterans Administration; 89,000 in the Treasury Department; 70,000 in the Department of Agriculture; 45,000 in the Department of the Interior, down to only 3,400 in the Department of Labor—a mere handful. Veterans constitute 47 per cent of all federal employees.

There is a certain fascination in the spectacle of a nation strangling itself by paternalism. The process can be stopped only by a mass reaction, and yet if it continues the outcome is inevitable.—*"Top-Heavy Payroll," New England J. Med. 241:77 (July 14) 1949.*

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EDITORIALS

THE WHITE HOUSE CONFERENCE ON YOUTH—ANOTHER UNILATERAL PROGRAM BY GOVERNMENT

LATE in 1950, the federal government will sponsor another decennial conference on the problems of children and youth in the United States. One of the principal objectives of this meeting—to be known as the 1950 Midcentury White House Conference on Children and Youth—is to find the means of improving the health of all American children. Yet nowhere on the roster of 52 individuals named by President Truman to a national committee for the Conference is there the name of a representative of the dental profession.

The American Dental Association and the dental profession can wholeheartedly endorse the announced objectives of this conference, which are validly in the interest of the welfare of children and youth. Yet they cannot but wonder what methods the Washington officials have in mind when, in their planning, they openly neglect the dental health of American youth which is such an important segment of their physical well-being. Surely it should not be necessary to have to inform the officials of the Children's Bureau and related agencies, who have been staging such conferences for decades, that dental disease is the most common affliction among American children today. Surely they must be aware that pious resolutions and master planning which ignores the dental profession will do little to fill a cavity in a child's tooth or to carry out an effective preventive program which will assure optimum dental health for all children.

Belatedly, the officials of the Children's Bureau have informed the American Dental Association that it will be asked to contribute to the Conference when it is held.

But apparently this "contribution" will be permitted only after the plans and program have been fully formulated.

If the Conference is to be a sincere, wholehearted effort to improve the status of our children, their physical, mental, emotional and moral development, the dental profession will be able to make a real contribution. If, however, the Conference is to evolve as a unilateral presentation of governmental notions directly connected with political objectives and only indirectly connected with the health of children, the Association will not be unwilling to see it pass into history as a sorry monument to mistaken ideals and effort.

HOUSE OF DELEGATES APPROVES RECOMMENDATION TO RAISE ANNUAL DUES

The House of Delegates, at the ninetieth session of the Association in October, approved a recommendation to increase active membership dues from $12 to $20 a year. This action was taken after due deliberation and full consideration of the Association's needs, resources and commitments. Final action on the recommendation will be taken at the 1950 session. If approved by the delegates at that time, the eight dollar raise in dues will become effective in January 1951. At the same session the House of Delegates approved a budget of $1,305,500 for 1950 which is $8,937 less than the anticipated income for the coming year—a balanced budget, but one so nicely balanced that it is precarious. A slight decrease in anticipated income, or a slight increase in anticipated expenses would force the Association again to draw on its diminished reserves.

In passing this year's budget, and in voicing its approval of an increase in dues, the House of Delegates took into consideration the facts that present activities must be continued, some activities must be expanded and that the reserves, without which the Association could not have functioned effectively during the past three years, must be rebuilt as speedily as possible. With an annual expenditure of over a million and a quarter dollars, the current assets should at least equal that amount.

Prior to 1940 the Association was able to discharge its duties at an extremely low cost per member. In 1941, for instance, the cost of conducting all Association activities was but $4.98 per member. By 1949 these costs, based upon the current budget, had risen to $12.57 per member—an increase of 252 per cent. The impact of World War II with its spiraling prices, the demand by members for more and better service, the increasing public appreciation of dentistry as a health service and the growing threat of national compulsory health insurance during the past ten years, has taxed the Association's energies and financial resources and caused it to draw heavily upon its reserves.

Between June 30, 1947 and December 31, 1948 the Association withdrew $429,637.52 from its reserves to finance activities, reducing them from $885,541.70 to $455,094.17. The House of Delegates stopped this drain in 1948 by raising dues from

$6 to $12. However, the raise was barely sufficient to offset the rise in prices. It did not provide for any further expansion of activities nor did it provide a surplus with which to rebuild its resources. The action of the House of Delegates in October, if approved next year, will place the Association on a firm financial foundation and enable it to furnish the services which members demand and should have.

The Association is extremely fortunate that former officials were foresighted enough to build a reserve upon which dentistry could draw in times of emergency. To a few members the former reserves of $885,541.70 seemed like a huge sum of money. However, it proved none too large when the Association found itself caught between ascending prices, expanding activities and increasing obligations. It is essential that the reserves be rebuilt so that sufficient funds be supplied for routine activities and that additional funds be provided, if necessary, for an expanded public information program which will enlighten the public regarding the dangers of compulsory health insurance.

The House of Delegates exhibited good judgment by approving an eight dollar raise in annual dues at this time. Twenty dollars a year—less than two dollars a month—will occasion no hardship on the individual member; but twenty dollars a year, multiplied by the entire membership, will enable the Association to function effectively in the best interests of the public and the profession.

START PLANNING NOW FOR CHILDREN'S DENTAL HEALTH DAY, FEBRUARY 6

The first Monday in February, designated as Children's Dental Health Day for 1950, provides every state and component dental society with an opportunity to demonstrate dentistry's earnest desire to contribute to national health and welfare by improving the dental health of children in each community.

Forty years ago, when the oral hygiene movement first began to take definite form in this country, dentists could do little more than promise the benefits and advantages of preventive dental service for children. Today dentistry can provide more than promises. It can provide proof that early and regular dental care for children will present tooth loss even though it may not prevent decay. More and more communities during the past twenty-five years have demonstrated that parents, once educated, will insist upon good care for their children's deciduous as well as their permanent teeth and that such care will assure most children's reaching adulthood with a healthy dentition.

What these communities have done for their children can be done for children in all communities provided the dental profession takes the initiative and stimulates community leaders to initiate preventive dental procedures. Now that scientists have provided dentistry with a new weapon, fluorine, in its fight against dental caries, dental societies should have less difficulty than formerly in breaking down opposition to the establishment of community dental programs.

Dental societies that have not already done so are urged to start planning now for their community Children's Dental Health Day program on February 6. The Council on Dental Health is developing a quantity of excellent material that will aid in the development of your plans. This material will be sent to all dental societies during this month. Convert it to your needs and add your own ideas so that your Dental Health Day program will motivate the establishment of procedures that will raise the dental health standards of all children in your community.

FEDERATION DENTAIRE INTERNATIONALE INCREASES ITS ACTIVE MEMBERSHIP

THE Federation Dentaire Internationale, the only organization devoting itself exclusively to the international problems of dentistry, celebrates it fiftieth anniversary next year. Despite the disruptions caused by two world wars, linguistic and national barriers and meager funds, the Federation Dentaire Internationale has adhered steadfastly to its original objectives of raising the educational level of the profession and establishing closer relationships between dentistry and dentists throughout the world. This it has done by holding annual meetings, by promoting an International Dental Congress every five years, by encouraging activities of national dental associations that contribute to dental science and by compiling and preserving reports of such advances in its archives. Plans have now been completed for a new International Dental Journal, the first edition of which will be published next year—a fitting memorial to the mid-century anniversary of the Federation. So well has the Federation Dentaire Internationale succeeded in carrying out its objectives and in establishing itself as a scientific body that it has been selected as the agency to represent the dental profession in the World Health Organization.

The continued success of the Federation Dentaire Internationale, like the success of all organizations, depends largely upon an active, interested and informed membership. At the present time the United States Committee on Membership of the Federation Dentaire Internationale is conducting an active membership drive for the fiscal year which ends April 1950. Every member of the American Dental Association who is interested in contributing to the establishment of dentistry's place in international relations is invited to join. The cost of membership is $5.00 annually. Checks should be made out to Oren A. Oliver, Treasurer, United States Federation Dentaire Internationale Membership Fund, 1915 Broadway, Nashville, Tennessee.

INTERNATIONAL CORRESPONDENCE

NEWS FROM GREAT BRITAIN

Outstanding among recent comment on the bill before Parliament to amend the National Health Service Act was a statement by Minister of Health Aneurin Bevan in which he said "I am satisfied, on experience, that misconduct is on the decrease and the behavior on the part of the dentists concerned is improving." His comments were in reply to an attack made on the alleged unethical practices of a "large number" of dentists in the Service who also take private patients.

M. P. Baird, who also is a dentist, told the British legislators that he was speaking for a large number of his constituents and not as a dentist when he said three main "rackets" are being operated by dentists in his division. First among these practices, he said, are the cases where the dentist is "too busy" to extract a tooth until the patient volunteers to pay the private fee.

It follows, he added, that since conservative treatment pays better in the Health Service fee scale, the dentists are refusing patients who want dentures. Finally, he said, there is the practice of "talking down" the Health Service as a whole, saying that only second-rate treatment and dentures may be provided because of the inadequate fee. The dentist then suggests that if better service is desired that the patient come to him privately.

In support of the argument for a full-time salaried service for dentistry, M.P. Baird said that 75 per cent of the dentists in his division are turning away patients unless they can pay. He also indicated that he believed income tax dodging is rampant among the dentists accepting private as well as Health Service patients.

Unlike the Health Minister's comments of a few months ago in which he attacked the dental profession in Great Britain, Mr. Bevan took to task Dr. Baird's resolution that no dentist in the Health Service be entitled to accept remuneration from private patients and it was dropped.

There is no doubt that some abuses in the Service do exist. However, they are consistently practiced by a very small minority while the vast majority work hard to maintain a good ethical standard. It is of course those whose practice is not in accordance with the best traditions or who fail to comply with the regulations of the Service that have a news value. The reports of the Tribunals which meet to consider dental disciplinary cases get wide coverage in the press. Fortunately the names are withheld but this publicity is damaging to the profession as a whole.

There seems to be an increased demand for private treatment from the dentists who did not enter the service—about six per cent now. They are being kept busy, a reversal of the trend about a year ago when such practices became very quiet indeed.

With the approach of year's end, activity is increasing to wind up the affairs of the nation's three separate dental societies in anticipation of the amalgamation under the title of the British Dental Association. Many of the older members look back and, in the lull before the signal to march forward together, feel some regrets at the passing of an epoch in the history of our profession. To those who are nearing retirement and who have served the societies that are now stepping into the pages of history there is little to look forward to in the new one. But to the profession of dentistry as a

whole and to the younger members in particular this amalgamation must be regarded as one of the most important events ever to have taken place. It must benefit all to have the profession united officially and for it to be able to speak with one voice.

All teachers of dentistry are agreed on the value of visual education through the medium of motion pictures. It is a source of regret that only a few films are available to dental teachers here in Britain. Especially is this so when one recollects the excellent films on maxillofacial surgery made at East Grinstead during the war by P. Rae Shepherd and his colleagues.

The Dental Board of the United Kingdom was aware of the value of films for teaching and authorized at the beginning of this year a conference representative of interested organizations and individuals to examine the development of visual methods in undergraduate and post graduate dental education. The conference resulted in formation of the Dental Films Advisory Committee which is considering establishment of a central film library and a policy for stimulating the use of visual aids in dental education.

The Dental Board has recently bought two films from America titled respectively "Silicate Cement" and "Dental Amalgam Failure Caused by Moisture Contamination." In addition the board asked Dean Bradlaw to produce a series of film strips on oral pathology to aid teaching of this subject in Britain.

THE NATIONAL SCENE

from The Journal's Washington Correspondent

The formidable task of ironing out innumerable kinks in policies and practices affecting dentists and physicians who are military reservists was launched in November, a development that highlighted an otherwise routine, Congress-less month in the National Capital. Politically, it was a poor month for news, although Senator Hubert H. Humphrey aroused more than a ripple of reaction when he—a co-sponsor of the Thomas-Murray-Dingell bill—announced that he is now opposed to the bill's provisions for compulsory health insurance in their present form. Scores of Army, Navy and Air Force dentists, including top ranking officers of the respective dental corps, came to Washington for the annual meeting of Association of Military Surgeons. Lobbying reports for the third quarter of 1949 were made public on Capitol Hill, revealing that American Dental Association expenditures for the first nine months of the year were $15,000, compared with the $1,225,028 of American Medical Association.

Nov. 14 marked the first meeting of a special five-man "task force" whose job is to advise the Secretary of Defense and the Cooper Committee on ways and means of making membership in the Dental and Medical Corps more attractive to the doctor as well as more useful to the government. The group decided to begin holding hearings on Monday and Tuesday each week, beginning Nov. 21 and continuing up to Christmas week. Several weeks ago the A.D.A. was informed that the comprehensive study was in prospect and invited to submit recommendations. Dentistry's representative on the committee is Dr. Charles R. Wells, of Brooklyn, N. Y.

Fifteen institutions, principally dental schools, will receive a total of $77,000 in federal grants for aid to teaching and research, according to a recent announcement by Federal Security Agency. To 11 dental schools, an average of $5,000 each was awarded to strengthen teaching of oral pathology and diagnosis with relation to cancer, the grants having been recommended by National Cancer Advisory Council. Furtherance of basic research is the objective of six other grants, totaling $22,897. The sum is exclusive of $160,708 which was allocated in midsummer for continued support of research projects which had previously received federal assistance.

According to U. S. Public Health Service, 37 of the nation's 41 dental schools are now getting government aid for support of teaching. Recipients of the latest grants are University of Alabama School of Dentistry, Iowa State College of Dentistry, Loyola University School of Dentistry (New Orleans), Harvard, Tufts, Columbia, New York University, Ohio State, Temple, Pittsburgh and Tennessee.

An unexpectedly large number of applications for dental services has been noted this fall by Veterans Administration, presenting indications that the backlog of prospective patients—reduced appreciably during the past year—is destined for another rise to large proportions. Fund limitations, rather than a shortage of dentists participating in the program, are responsible for the inability to keep up with the demand for services

by veterans. This is true despite the fact that approximately 75 cents of every dollar earmarked by Veterans Administration for out-patient care is going to dentists.

In Milwaukee, where 85 per cent of out-patient care expenditures are dental, the case backlog stood at 1,275 on Oct. 1. In Boston, where the ratio is 67 per cent, it was 1,572. Similar situations exist in Los Angeles, Providence and other metropolitan areas.

Incidentally, Bion R. East, chief of VA's dental program, has resigned as associate dean of the faculty of medicine at Columbia University, a position from which he took leave in order to fill the federal post. He is not severing his connection with Columbia, however. He has been named, in absentia, to the new position of professor of dental public health practice in the university's School of Public Health.

The address delivered before the A.D.A. meeting in San Francisco by Senator Lester C. Hunt, of Wyoming, in which he indorsed a deductible type of health insurance, has attracted attention of fellow members of Congress as well as the public at large. One of his colleagues, Senator H. Alexander Smith, of New Jersey, has asked him to furnish more details on this type of prepayment plan with the object in mind of offering it for discussion to Smith's fellow members of the Senate Labor and Public Welfare Committee when Congress convenes in January. Paul H. Douglas of Illinois is another Senator who has made a number of public statements in recent weeks supporting the principle of voluntary prepayment insurance geared particularly for protection against catastrophic illness with attendant high costs.

Civilian dental and medical practitioners who are members of the Naval Reserve attended the sixth course in medical aspects of special weapons and radioactive isotopes held at National Naval Medical Center the week of Nov. 14.

LEGISLATION

ACTION ON LARGE NUMBER OF HEALTH BILLS LIKELY IN SECOND SESSION OF CONGRESS

Although the 81st Congress passed only one major health bill during its first session it probably set a record for testimony taken on a wide variety of health and related measures, indicating that actual legislative action will be taken on many proposed health laws when it convenes in January.

Late in the first session the legislators approved a bill (S.614) which doubled appropriations for hospital construction under the Hill-Burton Act. The action relates to dentistry in that it provides for the establishment of dental departments in the new hospitals.

President Truman's program for compulsory health insurance bogged down despite the packaging treatment given it in the current Thomas-Murray-Dingell bill (S.1679). Except for Title VII, the compulsory health insurance aspect, all of the six other titles in the measure were replaced during the session with substitute bills, one of which (S.614) became law.

Positive action on other health measures came largely from the Senate. Major among the bills passed by the upper house and now in the hands of the House of Representatives were S.1453 which would

provide financial aid to schools training dentists, physicians, nurses, and other health personnel; S.247, which would provide federal funds for the stimulation and coordination of research in a number of fields (there appears to be some uncertainty as to the status of dental research in the bill), and S.1411, which sets up a $35,000,000 fund to be distributed among the states for the advancement of child health. The latter bill has not received the endorsement of the Association owing to the fact that no provision is made for determining those who need financial assistance under the programs to be established.

In relation to S.1453, the A.D.A. House of Delegates went on record during its 90th annual session in San Francisco, last October, as being in favor of federal aid to professional education but qualified its stand by stating unequivocally that such aid would have to come unencumbered.

Another measure which would provide $20,000,000 annually for aid to state public health programs also was approved by the Senate.

The Army dental bill (S.2380) which would provide greater administrative freedom for Army dental officers, received the green light from the Senate but bogged down in the House Armed Services Committee. Representative Walter Brehm (R., Ohio), a dentist, placed an identical bill in the House but it also was consigned to the Armed Services Committee and was not reported out for action. A.D.A.'s House of Delegates clarified the Association's position on this matter when it approved in principle the contents of the bills and added that the Army Dental Corps along with the other military health services should be placed under a unified military health services command.

Bills passed by Congress in which the Association took an active interest this year include H.R. 6022, providing a raise in salary for dentists in the Veterans Administration and establishing a "chief grade" for dentists, and H.R. 4516 which allows the Navy to retain dentists and physicians with the rank of captain in the service beyond the statutory retirement age. Another Veterans Administration measure likely to receive early attention in the next session is H.R. 3209 and its counterpart, S.2249, which would establish the "specialist grade" in the V.A. dental service. H.R. 6150 and S.2541, which authorizes the V.A. department of medicine and surgery to send dentists and physicians to civilian institutions for postgraduate training, also is in line for action.

The A.D.A. Council on Legislation probably will take immediate action to get Senate approval of H.J. Res. 184, which authorizes the President to proclaim Feb. 6 as National Children's Dental Health Day. The measure has been passed by the House.

Two other bills (S.2008 and H.R. 5182) which involve the establishment of a united medical administration are likely candidates for debate in both houses of Congress during the coming session. They have been introduced respectively by Senator Elbert D. Thomas (D., Utah) and Representative Clare E. Hoffman (R., Mich.).

Among the major measures defeated or held in abeyance during the last session against which the A.D.A. actively campaigned are the Thomas-Murray-Dingell bill and President Truman's Reorganization Plan No. 1. The latter measure would have established a federal department of welfare under which the health, education and security aspects of the Federal Security Agency would have been placed.

A similar measure (H.R. 782) has been reported out of the House Committee on Expenditures in the Executive Department favorably, indicating that the Administration may again push for establishment of a welfare department with cabinet status.

A. D. A. AFFAIRS

1949-50 A.D.A. RELIEF FUND CAMPAIGN GETS UNDER WAY; GOAL SET AT $100,000

The Christmas Seals which serve as an annual reminder that the A. D. A. Relief Fund campaign is under way have been sent to every member of the Association and although early returns are too few to tabulate they indicate that recipients are more than doubling their last year's contributions. This year's goal is $100,000.

In connection with the 1949-50 campaign, John S. Owens, of Camden, N. J., chairman of the Association's Council on Relief, informed all constituent dental societies early last month of the contribution quotas assigned. Under present regulations, the state dental society receives half of each contribution made by its members.

The A.D.A. pays two thirds of each amount granted to dentists in serious need of financial assistance, with the constituent society supplying the remaining one third.

Although last year's Relief Fund goal was 100,000, contributions reached only $61,312.89 and Dr. Owens has pointed out that demands for grants from the fund ran higher in 1948-49 than ever before. He also stated that all Relief Fund monies are protected under a perpetual trust arrangement adopted by the House of Delegates at the 89th annual session in Chicago, in 1948.

Members this year are being asked to double their contributions of last year. The slogan for the 1949-50 campaign is "Let's Double It in '49." Contributions should be sent directly to the American Dental Association Relief Fund, 222 E. Superior St., Chicago 11.

A tabulation by constituent societies of this year's quotas as compared to last year's contributions follows:

	1949-50 Quotas	1948-49 Contributions
Alabama	$ 810.00	$ 1,697.00
Arizona	260.00	264.00
Arkansas	490.00	207.50
Air Force*	150.00*	
Army	360.00	186.50
California	3,640.00	2,224.62
So. California	4,340.00	4,700.50
Colorado	880.00	681.00
Connecticut	1,940.00	1,549.00
Delaware	150.00	71.00
Dist. of Columbia	810.00	1,600.00
Florida	1,180.00	720.00
Georgia	1,020.00	478.00
Hawaii	360.00	300.00
Idaho	270.00	162.50
Illinois	7,640.00	4,494.00
Indiana	2,340.00	1,345.00
Iowa	1,910.00	1,078.25
Kansas	1,130.00	760.92
Kentucky	1,100.00	825.00
Louisiana	1,040.00	388.20
Maine	420.00	224.00
Maryland	1,040.00	565.00
Massachusetts	3,780.00	1,541.00
Michigan	3,900.00	2,129.00
Minnesota	3,060.00	1,634.08
Mississippi	500.00	360.10
Missouri	2,670.00	2,050.50
Montana	340.00	210.00
Navy	710.00	149.50
Nebraska	1,160.00	934.00
Nevada	100.00	75.50
New Hampshire	410.00	151.00
New Jersey	4,290.00	2,641.00
New Mexico	190.00	134.00
New York	15,560.00	8,361.88
North Carolina	1,190.00	1,152.00
North Dakota	340.00	405.00
Ohio	4,910.00	2,443.33

Oklahoma	920.00	492.50
Oregon	1,150.00	894.00
Panama Canal	30.00	36.00
Pennsylvania	7,260.00	3,685.50
Public Health Service	300.00	56.50
Puerto Rico	290.00	74.50
Rhode Island	530.00	125.00
South Carolina	380.00	204.50
South Dakota	350.00	125.00
Tennessee	1,100.00	869.50
Texas	3,040.00	1,421.50
Utah	470.00	363.00
Vermont	210.00	100.50
Vet. Adm.	980.00	249.00
Virginia	1,120.00	655.00
Washington	1,680.00	1,178.50
West Virginia	730.00	526.00
Wisconsin	2,990.00	1,184.51
Wyoming	170.00	102.00
TOTALS	$100,000.00	$61,312.89

*Formerly included with Army.

SCIENTIFIC EXHIBITS RATED BY COMMITTEE OF JUDGES

First prize for scientific exhibits shown at the 90th annual session in San Francisco, Oct. 17-20, went to one on cleft palate prosthesis presented by the Pennsylvania State College speech and hearing clinic. A total of 34 scientific exhibits were included in this year's scientific section.

An exhibit by Noble G. Wills entitled "Evolution in the Development of Surveying and Designing Instruments for Partial Denture Use" won second honors and third prize went to an exhibit on silicate cements sponsored by the A.D.A. Council on Dental Research and the National Bureau of Standards.

Exhibitors receiving honorable mention are as follows: dental roentgenologic findings in systemic disease, by the Mayo Clinic; Naval dental research, by Naval Medical Research Institute; procaine dermatitis, by University of Chicago; sludged blood, by University of Chicago; differential diagnosis and treatment of oral tumors, by Army Institute of Pathology; biologic production of ammonia in the oral cavity and the use of ammonia preparations in caries control, by University of Illinois college of dentistry; oral cancer and cysts and tumors of the jaws, by the University of Southern California dental school; dental teaching methods, by the University of California dental school, and audio-visual education, by the Navy Bureau of Medicine and Surgery.

G. B. DENTON APPOINTED TO A.D.A. CENTRAL OFFICE STAFF

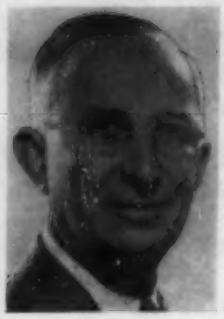
George B. Denton, recently retired after serving 33 years as professor of dental literature and history at Northwestern University dental school, was appointed to the A.D.A. Central Office staff, Oct. 3, to work on a number of projects including one on nomenclature for the Bureau of Library and Indexing Service. Announcement of the appointment was made by Harold Hillenbrand, secretary of the Association.

A Ph.D. from the University of Michigan, Dr. Denton long has been known in dental circles as an outstanding contributor to dental literature. Among other projects he is working on are preparation of a style manual for THE JOURNAL and a glossary of terms for the Council on Dental Health. He also has been compiling a history of dentistry not associated with his duties at the A.D.A.

D. A. WALLACE RESIGNS AS SECRETARY OF A.D.A. COUNCIL

Donald A. Wallace resigned as secretary of the A.D.A. Council on Dental Therapeutics on Nov. 1 and has been appointed assistant research manager for the Pepsodent Division of Lever Brothers Company. J. Roy Doty, director of the Bureau of Chemistry, has been named acting secretary of the Council. Dr. Wallace originally joined the A.D.A. in 1938 as a staff chemist.

TWO NEW TRUSTEES ELECTED—FOUR REELECTED AT 90th ANNUAL SESSION



← Reelected were: (top) J. B. Carr, Indianapolis, Seventh District; (center) C. S. Foster, Cedar Rapids, Iowa, Tenth District, and (bottom) Robert P. Thomas, Louisville, Sixth District.

Elected were: (top) C. I. Taggart, Burlington, Vt., First District and (bottom) L. H. Jacob, Peoria, Ill., Eighth District.

A.D.A. PROTESTS LACK OF DENTAL PARTICIPATION IN PLANNING 1950 WHITE HOUSE YOUTH CONFERENCE

A strong protest has been lodged by the A.D.A. with the U. S. Children's Bureau, an agency of the Federal Security Agency, at the refusal of government officials to appoint a representative of the dental profession on the national committee sponsoring a midcentury conference on children and youth, to be held in Washington, D. C., late in 1950. Although the conference is being called by President Truman, it nominally is under the direction of the Children's Bureau.

The Association was requested to contribute to the conference in a letter from Miss Katharine Lenroot, chief of the Children's Bureau and secretary of the national committee for the conference, just one day following the announcement by the President of the committee's membership which included a few physicians and no dentists.

"The 52 citizens appointed by the president to direct the conference undertaking were selected primarily for their interest in young people and for their ability to contribute knowledge, experience and leadership in furthering this nation-wide effort to advance the well-being of our Nation's children," Miss Lenroot's letter said in part. Included in the membership of the committee are officials of such organizations as the Farmer's Union, National Congress of Parents and Teachers, National Federation of Women's Clubs, C.I.O., A.F. of L., United Automobile Workers, International Ladies' Garment Workers Union, National Lutheran Council, American Legion, Institute for Psychoanalysis, Association for Childhood Education International, New York United Jewish Appeal, a number of foundations, educators and businessmen.

In a letter to Miss Lenroot, Harold Hillenbrand, secretary of the Association, stated:

"I have examined the list of those appointed to the national committee, and I am impressed by the fact that it was possible to give representation to so many groups and activities without chancing on a member of the dental profession.

"The dental profession and the American Dental Association yield to no group in their concern for the health of children and it is disturbing to me that dental representation has been overlooked even by those who have reason to have great familiarity with the important relation of dental health to children and youth.

"I am sure that you will recognize that cooperation in such an important matter as a conference on children and youth must not be unilateral."

In reply, Leona Baumgartner, M.D., associate chief of the Bureau, said: "Appointments by the President to the national committee for the midcentury White House conference were not made on the basis of organizational or professional affiliations. Rather, the 52 persons on the committee were selected primarily because they were prominent citizens who could give leadership to this national effort." Dr. Baumgartner added that the national committee had made provision "for cooperation and use of the contributions of groups such as the American Dental Association."

A.D.A. officials stated that the conference apparently is an effort to predetermine that the government viewpoints and policies will be routinely approved.

Federal Security Administrator Oscar R. Ewing, who is chairman of the national committee for the conference, announced just before press time that an advisory council to the national committee was being formed and would meet Nov. 21 to "provide an opportunity for national organizations to work with the Conference . . . to formulate and achieve

Conference objectives." It was noted by the A.D.A., however, that most if not all of the major planning for the conference already is completed.

Cited as examples of how far the planning and establishment of policies for the conference has gone are such items as a 16-page booklet which proposes to answer the following questions: "Why a conference?", "How will it work?", and "What can it mean to you?" In addition a pamphlet featuring greetings from Mr. Truman and Mr. Ewing, states that the conference will "Focus on Child's Mental, Emotional, and Spiritual Growth and Development." Nowhere in the pamphlet's headlines was child health mentioned.

INTER-ASSOCIATION COMMITTEE FORMED TO SEEK IMPROVEMENT OF THE NATION'S HEALTH

The establishment of an Inter-Association Committee on Health, composed of six of the nation's largest professional organizations and designed to contribute to the "major objectives of improving the health of the nation," was announced Nov. 14 following a formal organization meeting in New York, Nov. 12.

In addition to the A.D.A., organizations participating in the Committee are: the American Hospital Association, the American Medical Association, the American Nurses Association, the American Public Health Association and the American Public Welfare Association. Philip E. Adams, of Boston, president of the A.D.A., was chairman of the organization meeting. The chairmanship will rotate among representatives of the other organizations at future meetings.

In facilitating the exchange of information on the programs of the participating organizations, the Committee will work toward the end "that a common understanding may be reached toward the solution of national health problems," a formal statement said.

"It is to be hoped that this group, representing large associations of national character, can present a united front on many of the problems that affect the health and welfare of the American people," Dr. Adams said in a statement.

Raymond M. Hilliard, New York welfare commissioner, who acted as spokesman for the Committee, said that current surveys of dental and medical schools being made by the U.S. Public Health Service and interested professional organizations were endorsed. Similar studies among educational institutions in other fields related to health also were urged by the Committee, he said.

Mr. Hilliard was further quoted by the *New York Times* as having said the Committee approved the following findings: "(1) That there is evidence of 'definite shortages' in numbers and distribution of qualified personnel in the nursing and public health fields in respect to the needs of the public. (2) That there is evidence of a need of 'better distribution' of physicians, although no statement as to the need of additional physicians is warranted until the effect is evident of the enrollment in medical schools, now 10 per cent higher than in the five years before World War II, and of the recent establishment of new medical schools. (3) That a statement as to possible needs in the field of dentistry should await results of a survey being made by the American Dental Association." It also was reported that the Committee discussed but took no action on H.R. 6000, a measure approved by the House of Representatives which provides for extension of health services to the needy.

Representing the A.D.A. were Dr. Adams; William McGill Burns, trustee, Brooklyn; Kenneth A. Easlick, Ann Arbor, Mich.; Harold Hillenbrand, secretary, Chicago. Representing the American Hospital Association were: Mr. John N. Hatfield, president, Philadelphia; Mr. John H. Hayes, New York City; Charles F. Wilinsky, M.D., president-elect, Boston; Mr. George Bugbee, executive director, Chicago. Representing the American Medical Association were Louis H. Bauer, M.D., chairman, Board of Trustees, New York; E. S. Hamilton, M.D., Kankakee, Ill.; E. L. Henderson, M.D., president-elect, Louisville; James R. Miller, M.D., trustee, Hartford, Conn.; George F. Lull, M.D., general manager, Chicago. Representing the American Nurses Association were Agnes Gelinas, New York; Ruth W. Hubbard, Philadelphia; Elizabeth K. Porter, Cleveland; Ella Best, executive secretary, New York. Representing the American Public Health Association were Hugh R. Leavell, M.D., chairman, Executive Board, Boston; Lowell J. Reed, M.D., president, Baltimore; Dean A. Clark, M.D., Boston; R. M. Atwater, M.D., secretary, New York. Representing the American Public Welfare Association were Loula Dunn, director, Chicago; Mr. Raymond M. Hilliard, member, Board of Directors, New York; Mr. James Brindle, chairman, Committee on Medical Care; Dr. Ellen C. Potter, M.D., Trenton, N. J.; Miss Elizabeth Wickenden, Washington, D. C. The original meeting was called by the A.M.A. Next meeting is scheduled for Jan. 7.

APPLICATIONS BEING RECEIVED FOR A.D.A. RESEARCH POSITION

Applications are being received by the A.D.A. Council on Dental Research from qualified dentists for the position of A.D.A. research associate in the National Bureau of Standards, according to J. L. T. Appleton, of Philadelphia, Council chairman. The position will be available on Dec. 1.

Providing an opportunity for training in dental research, the position will entail work both in the clinic and laboratory. The applicant will be required to secure a license to practice dentistry in the District of Columbia within a year from the date of his employment. Salary for the position will be from $4,000 to $5,000, depending on the applicant's experience.

NINETIETH ANNUAL SESSION ATTENDANCE REACHED 10,822

A final tabulation of attendance at the 90th annual session of the A.D.A., held in San Francisco, Oct. 17-20, reached a total of 10,822, John J. Hollister, Association business manager reports.

Of the total, 5,513 were members, 2,532 were guests, and 1,050 were dental assistants and hygienists. Others making up the tabulation included 537 dental students, 686 commercial exhibitors, 286 technicians, 125 scientific exhibitors and 93 foreign dentists. Attendance at the meeting was among the largest in Association history.

COUNCIL ON LEGISLATION RE-ORGANIZES, REVIEWS POLICIES

The Council on Legislation met at the Central Office, Nov. 12-13, to discuss current national legislation in light of the recent policies adopted by the A.D.A. House of Delegates and established a new organizational pattern for Council operations.

Bruce R. Kurtz, of Pasadena, Calif., was elected vice-chairman of the Council during the meeting which was directed by E. Harold Gale, of Albany, New York, chairman.

Under the new organizational pattern,

the nation was broken into five geographical regions and each Council member was delegated to maintain liaison with Council consultants and the state dental societies in a given region, according to Council secretary, Francis J. Garvey. The Council now has a consultant in every state. Council members also delineated specific fields of interest related to legislation with a view to developing expert opinion on a wide variety of legislative subjects. The date for the next Council meeting is Feb. 5-6.

DENTAL EDUCATION

CONGRESS ON DENTAL EDUCATION AND LICENSURE MEETS FEB. 4

The sixth annual Congress on Dental Education and Licensure, sponsored by the A.D.A. Council on Dental Education, will be held in Chicago, Feb. 4, according to Shailer Peterson, Council secretary. A program planning meeting was to be held by the Council late in November.

In general, the Congresses have resulted in an effort by both dental educators and dental examiners to effect improvement in dental curriculums and dental examining methods. It was stated by the Congress last year that "the dental curriculum should be flexible, adaptable, and capable of adjustment in the light of constantly increasing scientific knowledge"; and that "examining processes should be harmonized with progressive teaching and should be kept abreast of assured forward movements in dental practice." The importance of preventive as well as restorative dentistry to adequate dental care for the people also was pointed out.

Invitations to attend this year's Congress have been extended by the Council to all dental educators and examiners, Dr. Peterson said, adding that it is hoped that last year's attendance of 150 will be broken.

Another meeting devoted to examination methods and testing technics will be held in Chicago sometime during the week following the Congress by the American Association of Dental Examiners. Experts in the field of examination and testing will be invited in addition to dental educators and examiners, according to Philip L. Schwartz, of New Brunswick, N. J., in charge of arrangements. The first meeting of this type was conducted in San Francisco during the 90th annual session of the A.D.A.

POSTGRADUATE COURSES LISTED BY UNIVERSITY OF PENNSYLVANIA

A program of postgraduate dental education in which some 25 courses are to be given has been announced by Lester W. Burket, director of postgraduate courses at the University of Pennsylvania school of dentistry.

The courses and the months in which they will be given follow: oral surgery, and anesthesia, December and June; prevention and control of dental caries, December; ceramics, February and March; complete denture prosthesis, May; complete dentures, January through May; crown and bridge precision attachment prosthesis, January; dentistry for children, January through March; endodontics—immediate root resection, June; gold inlay restorations, March; mechanical principles of restorative dentistry, June; mouth rehabilitation including precision attachment of partial dentures, January; oral diagnosis and roentgenology, January; orthodontics, June and July; oral hygiene, May; partial denture design, May and June; periodontics, December; periodontics and oral medicine, March; preventive dentistry including caries control and preventive orthodontics, February, and teaching technics for teachers of dentistry, June.

Additional information may be secured by writing Dr. Burket, University of Pennsylvania school of dentistry, 4001 Spruce St., Philadelphia 4.

ORTHODONTICS IS SUBJECT OF POSTGRADUATE COURSE

A postgraduate course in orthodontics will be given by the University of Toronto faculty of dentistry during the week of April 17-21, Roy G. Ellis, dean, announces. The course is designed to provide practical instruction and will emphasize such subjects as case evaluation, determination of construction and indications for the simple orthodontic appliances, and diagnostic aids for the general practitioner. Additional information may be secured by writing the dean at 230 College St., Toronto, Ont.

1950 DATE SET FOR SEVENTH DENTAL MEDICINE SEMINAR

At the close of the sixth annual seminar for the study and practice of dental medicine, Oct. 23-28, at Palm Springs, Calif., Hermann Becks, president of the meeting announced that next year's meeting will be held Oct. 15-20, in Palm Springs. He also stated that this year's intensive four-day meeting was "by far the most successful" of the series.

POSTGRADUATE EDUCATION BY TELEPHONE REACHES 7,000

An estimated 7,000 dentists in 39 states, the District of Columbia and Canada participated in the first nation-wide telephone extension course presented by the University of Illinois dental school, Oct. 10, and it has been announced that additional groups are being accepted for the four remaining programs.

Those attending the postgraduate courses by telephone represent 142 dental societies and dental study clubs, the University states, adding that more than 14,500 miles of telephone lines were used to carry the program from Chicago. Reports from many sections of the country indicated that the reception was good, according to Allan G. Brodie, dean of the dental school.

Remaining programs which will feature experts on various aspects of dentistry are: "Nutrition in Dentistry," Jan. 9; "Dentistry for Children," Feb. 13; "The Masticatory Mechanism," Mar. 13, and "Oral Diagnosis and Cancer Control," April 10.

SOUTHERN CALIFORNIA DENTAL SCHOOL LISTS APPOINTMENTS

The appointment of five professors, an assistant professor and a number of instructors to man the newly expanded department of pedodontics in the University of Southern California school of dentistry has been announced by John C. Brauer, dean.

Fred B. Olds, of Los Angeles, an alumnus of Southern California and a past-president of the Southern California State Dental Association, was named professor and head of the department of practice administration and ethics. George M. Hollenbeck, a professor of fixed prosthesis at the University from 1920 to 1932, was appointed professor of dental research and Charles M. Woodward, of Pasadena, a staff member in several hospitals and clinics and long active in postgraduate education, was named professor of oral surgery.

Arthur E. Smith, who is both a dentist and a physician, has been appointed professor of reconstructive plastic, maxillofacial and oral surgery, and H. Newman Brownson has been named professor of oral surgery and head of the dental school's department of surgery.

UNIVERSITY OF WASHINGTON HAS NEW DENTAL SCHOOL QUARTERS

The University of Washington recently dedicated its new $9,000,000 Health Sciences Building which houses the University's new school of dentistry and medicine and its school of nursing. Additions for the college of pharmacy and a research hospital are planned for the immediate future.

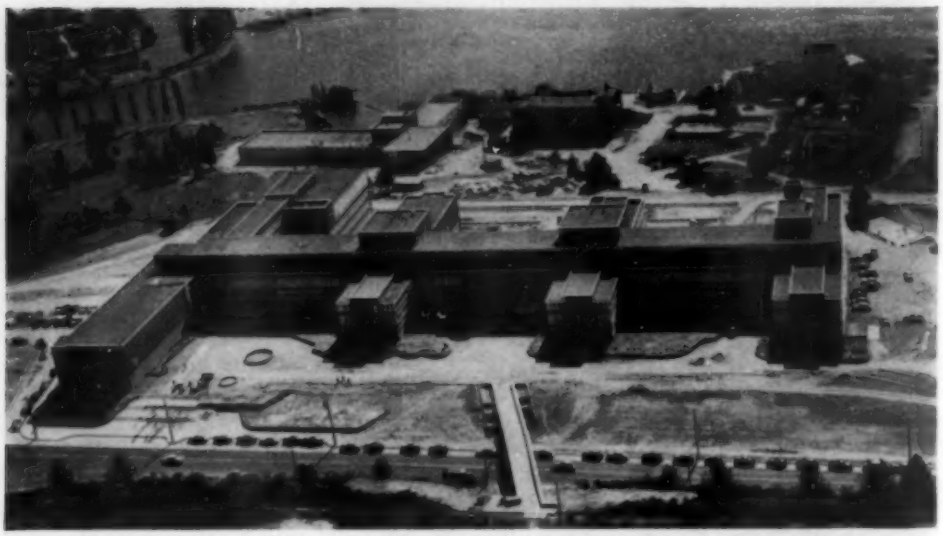
The first classes in dentistry and medicine, which will graduate next spring, have been held in other buildings while the new building was being erected.

Donald G. Anderson, secretary of the Council on Medical Education and Hospitals of the American Medical Association, gave the dedication address, Governor Arthur B. Langlie laid the cornerstone and Raymond B. Allen, president of the University, presided.

One of the most outstanding rooms in the building is the U-shaped dental operatory which covers nearly a half acre of floor space and is occupied by 110 dental chairs and cabinets. The operatory, walled by sheets of glass and glass brick, is so large that when all the 220 volt dental lamps are shining a special cooling system is necessary to keep the temperature comfortable.

The new Health Science Building will be used both by regular students and postgraduate and professional groups. Nearly 2,000 undergraduates and graduate students in dentistry, medicine and nursing will receive instruction in the new building this year in addition to 1,500 students from other departments who will receive instruction in basic medical sciences.

Deans of the units in the Health Sciences Division are: Dr. Ernest M. Jones, dentistry; Dr. Edward L. Turner, medicine; Dr. Elizabeth Soule, nursing, and Prof. Forest J. Goodrich, pharmacy.



This recently completed $9,000,000 Health Science Building at the University of Washington houses the schools of dentistry, medicine and nursing. The first classes in dentistry and medicine will graduate next spring.

DENTAL INTERNSHIPS AND RESIDENCIES ARE AVAILABLE

Applications for a dental internship at Coney Island Hospital, an institution belonging to New York City, are being accepted by the city's Department of Hospitals. The position is for a year, beginning July 1, 1950 and examinations will be held during the Christmas holidays. Additional information may be secured by writing A. J. Abeloff, director, department of dental surgery, Coney Island Hospital, Ocean Parkway and Avenue Z, Brooklyn 23.

Two other dental internships and two residencies will be open on July 1 at Sea View Hospital, Staten Island, N. Y. For information write I. E. Bruber, acting director, department of dentistry, Sea View Hospital, West New Brighton, Staten Island 14.

Jewish Sanitarium and Hospital for Chronic Diseases also announces internships are available beginning July 1. The appointments will be made for one year at $50 per month with full maintenance. Information may be secured by writing Leonard Kohn, director of the Hospital's dental department, E. 49th St. and Rutland Rd., Brooklyn 3.

NINE POSTGRADUATE COURSES TO BE GIVEN BY OHIO STATE

Ohio State University college of dentistry will conduct nine postgraduate dental courses, each to be limited to ten students, running consecutively from Jan. 9 through March 24, according to Hamilton B. G. Robinson, head of the dental school's postgraduate division.

The courses, their instructors and dates on which they will be given are as follows: oral pathology, Dr. Robinson, Jan. 9-13; anesthesia, M. Lowell Allison, Jan. 16-20; oral surgery, D. P. Snyder, Jan. 23-27; periodontia, John R. Wilson, Jan. 30-Feb. 3; children's dentistry, Lyle S. Pettit, Feb. 13-17; partial dentures, Victor L. Steffel, Feb. 20-24; full dentures, Carl O. Boucher, Feb. 17-March 3; endodontia, J. Henry Kaiser, March 6-10, and anatomy, Linden F. Edwards, March 20-24.

All the courses listed have been approved by the Veterans Administration and may be taken under the G.I. Bill of Rights. Further information may be secured by writing the postgraduate division, Columbus 10, Ohio.

CLINIC EXPANSION NOTED AT TEMPLE DENTAL SCHOOL

A total of 18 new dental chairs have been added to the main dental clinic of the Temple University school of dentistry making a total of 89 working stations for student dentists, it has been announced by Gerald D. Timmons, dean. It also was reported that six chairs have been added to the children's clinic which now has 24 working stations.

Dean Timmons pointed out in making the announcement that the dental school now has 506 men and women dental students from 18 states, Hawaii, Honduras and China, and that 66 per cent of the students are from Pennsylvania.

DENTAL SOCIETIES

ESSAY CONTEST BEING HELD BY ORTHODONTISTS' ASSOCIATION

A prize essay competition in which first award is $500 is being conducted by the American Association of Orthodontists. Second and third place winners will be given honorable mention and all three papers will be published.

The competition is open to any person "affiliated with a recognized institution in the field of dentistry as a teacher, researcher, undergraduate or graduate student," according to Allan G. Brodie,

chairman of the organization's research committee. Each essay submitted must represent an original investigation and contain some "new significant material of value to the art or science of orthodontics." Deadline for manuscripts which must be submitted in triplicate is March 15.

The author of the winning essay will be invited to present his paper at the Association's meeting in Chicago, May 8-11. Additional information may be obtained by writing Dr. Brodie, American Association of Orthodontists, 30 N. Michigan Ave., Chicago 2.

RESEARCH

NEW DENTAL RESEARCH FUNDS ALLOCATED BY FEDERAL AGENCY

Public Health Service grants totaling $22,897 for new dental research projects were made in October by the National Institute of Dental Research. These grants are in addition to grants announced in July amounting to $160,708 for continuing dental research projects already under way.

The list of new grants is as follows: University of Southern California, $9,843 for study of the growth and development of the face and the temporomandibular articulation under the stimulation of the adrenal cortex; University of Chicago, $3,456 for the study of oral lactobacillus associated with dental caries; Jewish Hospital of Brooklyn, $6,048 for the study of the composition of teeth and its relation to human dental caries; New York University, $513 for the study of the effect of standard drugs on dental tissues as indicated by P 32 measurements; Ohio State University, $1,575 for an experimental study of deformation and fracture patterns of the human mandible, and University of Oregon, $1,462 for investigation of the effect of alloxan diabetes on the incidence of dental caries in the Syrian Hamster and for clinical and laboratory examination of caries susceptibility in human diabetes before and after institution of treatment.

Additional grants of $19,847 for research projects in non-federal institutions have been recommended by the National Advisory Dental Research Council. This brings the total of recommended grants to $302,812 of which $183,327 has been allocated by the Federal Security Agency.

The Council made its most recent recommendations at a meeting Nov. 4, in Washington, D. C., at which two of the three new members appointed by Surgeon General Leonard A. Scheele attended. They are Percival C. Lowery, of Detroit, a member of the A.D.A., and Watson Davis, of Washington, director of Science Service. Mary Harrington, of Denver, a lawyer and member of the Colorado Public Health Council, the third new member, was unable to attend.

PUBLIC HEALTH

CHILDREN'S DENTAL HEALTH PROGRAM TO REACH 7,000

A total of some 7,000 first and fifth grade elementary pupils in Chicago schools are expected to be reached in the present semester through a comprehensive dental health education program inaugurated in the city recently. Plans for the program were prepared under the guidance of the Chicago Health Department dental hygiene section, the Chicago Dental Society, the Board of Education and the Northwestern University school of dental hygiene.

Faculty members from Loyola University and Northwestern University dental schools aided in planning the program which is designed to reduce the present rate of dental caries in the city's school-

age children. A Chicago-Cook County Health Survey, completed in 1947, showed that 90 per cent of these children were affected by dental caries. The new plan, it is stated, is to intensively promote the correction of dental defects and improvement of dental health through a positive program of education and follow-up of examinations. Initially the plan was introduced in three elementary schools on Oct. 19 and three schools will be added to the program each week until a total of 27 schools are served.

The new program involves preliminary classroom instruction by teachers and dental hygienists, motion pictures on dental health, dental inspection by health department dentists supplemented by volunteers from the dental society and hygienists from Northwestern, informing the parents of defects, and a general follow-up which stresses the value of regular visits to the dentist.

This program, according to the sponsors, supplements the City Health Department's 48 school dental clinics which now provide complete dental service for indigent children. More than 150,000 dental operations were performed in the clinics in 1948. A sodium fluoride program also was inaugurated last year among pre-school and school age children.

ARMED FORCES

AIR FORCE HEALTH PERSONNEL TO GET ADVANCED EDUCATION

Air Force dental and medical officers will have 21 dental and medical specialties from which to select courses for advanced training in civilian institutions in fiscal 1951, according to an announcement made recently by Air Force Surgeon General Malcolm C. Grow.

The majority of the courses will be at the graduate level, although they may not lead to a graduate degree, it was stated. All approved courses are a part of the Air Force's career program designed to provide well-trained health personnel.

Among the courses of particular interest to dentistry approved by the Surgeon General are: anesthesiology, public health, oral surgery, orthodontia, dental prosthesis, and nutrition.

Gen. Grow also reported the promotion of 14 dental officers to the grade of captain.

INTERNATIONAL

DRIVE TO AID EUROPEAN DENTAL LIBRARIES BEGINS

A campaign to raise $250,000 for the replacement of dental textbooks and reference works in the war-torn libraries of Europe is under way, Stanley D. Tylman, chairman of the A.D.A. Council on International Relations has announced. The CARE-UNESCO book program will handle distribution of the books recommended by a professional committee.

Plans for the Association's participation in the program were approved at the 90th annual session, in San Francisco, where it was announced that the A.D.A. already had made available about $8,000 worth of books to European libraries.

OPPORTUNITY TO JOIN F.D.I. STILL OPEN TO U.S. DENTISTS

The opportunity to join the Federation Dentaire Internationale, world-wide federation of national dental societies, for the year 1949-50 still is open to members of the A.D.A., Oren A. Oliver, of Nashville, Tenn., vice-president of the F.D.I., has announced. He warned, however, that only a limited number of memberships remain.

This invitation, the first to be offered dentists in the United States since 1947 when two-year memberships were accepted, was announced in September. Requests for new F.D.I. memberships or renewal of old memberships should be sent to Dr. Oliver, 1915 Broadway, Nashville, accompanied by a check for the annual dues of $5. It also has been pointed out that membership in the organization provides an opportunity to participate in the work of the World Health Organization.

GENERAL NEWS

COMPULSORY HEALTH INSURANCE OPPOSED IN 110 RESOLUTIONS

A total of 110 organizations associated with dentistry have passed resolutions opposing enactment of compulsory health insurance, a tabulation prepared by the A.D.A. Bureau of Public Information shows. It is believed, however, that many more organizations have passed similar resolutions but have not reported them.

Twenty-six A.D.A. constituent dental societies and 58 component societies have reported passing resolutions, many of them directly naming the current Thomas-Murray-Dingell bill. The most recent resolution of this nature was passed by a constituent dental society on Nov. 4.

Included in the tabulation were reports from the American Dental Hygienists Association and 18 of its components, all of which have stated their opposition to compulsory health insurance. Others reporting are the American Dental Assistants Association and four of its local units, the American Society of Oral Surgeons, Delta Sigma Delta and Xi Psi Phi fraternities, the American Academy of Restorative Dentistry, and two local dental laboratory organizations. Other organizations which have passed such resolutions are requested to send copies of them to the Council on Legislation, American Dental Association, 222 E. Superior St., Chicago 11.

CHAIRMAN EMERITUS OF A.D.A. THERAPEUTICS COUNCIL IS DEAD

H. S. Smith

Harold S. Smith, of Chicago, former chairman of the Council on Dental Therapeutics of the A.D.A., died Oct. 16. He was 67 years old.

Long active in dental society activities, Dr. Smith was to be honored by the American College of Dentists during their meeting in mid-October in San Francisco for his service as treasurer of that organization from 1925 to 1949. He also had been Grand Recorder Emeritus of Psi Omega dental fraternity since 1929. Dr. Smith retired from practice last year.

A native of Williston, Vt., Dr. Smith received his dental degree from Northwestern University and began practice in Chicago in 1905. He became a member of the City and county boards of health and in 1935 was instrumental in getting the city to appropriate $100,000 annually for dental care of school children. In 1932 he was named chairman of the A.D.A. Council on Dental Therapeutics, becoming a pioneer in the movement for standardization of dental drugs. He was elected Chairman Emeritus of the Council in 1947.

Dr. Smith was active for many years in both the Chicago Dental Society and the Illinois State Dental society having served as treasurer of the latter organization and trustee of the component society. Surviving are his widow, Cora, a brother, Willard and a sister, Alice.

FIFTY PER CENT OF MINNESOTA SCHOOL CHILDREN DENTALLY FIT

Approximately 50 per cent of the children in Minnesota's urban and rural schools have "OK teeth" the State Department of Health reports in the October issue of *Minnesota Health*. It also was stated that during the last two years the number of rooms or schools reporting healthy teeth for all students has been increased 36 per cent.

MEMORIAL PROGRAM HONORING LEO WINTER TO BE CONDUCTED

The Leo Winter Memorial Committee will conduct a meeting in honor of the late Dr. Winter, renowned oral surgeon and director of New York University dental school postgraduate division, on Jan. 25 at the University dental school. Maurice J. Hickey, new associate dean of the faculty of medicine, school of dentistry, will speak on the present and future status of oral surgery.

NEW DENTAL HEALTH FILM PRODUCED BY BRITANNICA

A new dental health education motion picture titled "Save Those Teeth" has been produced by Encyclopedia Britannica Films, Inc., Wilmette, Ill., and is now available, according to Allen O. Gruebbel, secretary of the A.D.A. Council on Dental Health.

First hand demonstrations designed to teach an 11 year old youth in the film that (1) daily care is necessary for healthy teeth, (2) the excessive use of sugar may cause tooth decay, (3) a well-balanced diet is important in the development of good teeth, (4) proper brushing helps prevent tooth decay, (5) the use of fluoride solutions on teeth helps prevent decay and (6) regular visits to the dentist are an important part of tooth care all are used. The film was produced in collaboration with J. Roy Blayney, director, Walter G. Zoller Memorial Dental Clinic, University of Chicago.

"Save Those Teeth" is a black and white, 16 mm. sound picture requiring 11 minutes' running time and may be purchased from Encyclopedia Britannica Films for $50, or rented from the Association for $2.50 per showing, or $4.50 a week.

HOSPITALS REPORT 29.3% HAVE DENTAL DEPARTMENTS

A total of 1,806 hospitals, or 29.3 per cent of those reporting, have dental departments, a survey made by the A.D.A. shows.

Of the 79 dental departments approved by the A.D.A., it was reported that 41 were approved for training interns and 20 approved for residencies. A mimeographed list of the hospitals reporting dental departments is now available from the Bureau of Economic Research and Statistics, according to B. Duane Moen, assistant director of the Bureau. Write the A.D.A., 222 E. Superior St., Chicago 11.

THE READER COMMENTS

THE JOURNAL devotes this section to comment by readers on topics of current interest to dentistry. The editors reserve the right to edit all communications to fit available space and require that all letters be signed. Signatures will be deleted before publication at the request of the author. Printed communications do not necessarily reflect the opinion or official policy of the Association. Your individual participation in this section is invited.—The Editor.

ON A PROPOSED HYPOTHESIS OF DENTAL CARIES ETIOLOGY

In a number of papers in the *British Dental Journal,* the *British Medical Journal,* and the *Biochemical Journal,* Pincus has reported studies dealing with the proteins of teeth. From these results he has developed "A New Hypothesis" of the etiology of dental caries.

This hypothesis may be summarized as follows:

1. Teeth proteins contain sulfuric acid in conjugated or combined form.
2. Microorganisms associated with the carious process elaborate enzymes, sulfatases, which are able to split sulfuric acid from simpler materials derived from the conjugated proteins of the enamel and dentin.
3. This free sulfuric acid reacts with the inorganic material of teeth, principally calcium phosphate, to produce calcium sulfate and other end products.

It will be noted that according to this idea, acid is derived from the tooth itself and not from an external or dietary source.

The basic studies reported by the author are of fundamental interest but it is likely that the caries hypothesis will be received with considerable reserve until there is more evidence that the suggested mechanism contributes significantly to the development of the carious lesion.

If we assume the correctness of the author's data for the ratio of total sulfur to nitrogen in enamel protein (.4/5.1); if we assume that all of this sulfur can be converted into sulfuric acid, and if we assume that the nitrogen content of enamel is 0.2%, it is possible to calculate the maximum amount of sulfuric acid that could be derived from a given weight of enamel. This calculated amount of sulfuric acid is no more than 1/600 (.15%) of the amount that would be required for the transformation of the tricalcium phosphate into dicalcium phosphate. Unfortunately, the author's data do not provide sufficient information for a similar calculation with respect to dentin. Presumably dentin because of its higher content of organic material could be a larger potential source of sulfuric acid.

A second uncertainty in connection with this hypothesis is the lack of information concerning the limiting effect of pH upon the action of the sulfatases. It is obvious that these enzymes must act at or below pH 6 if there is to be a significant accumulation of free acid.

Further investigations must also fill in the present gaps in the understanding of the mechanisms which relate to the transformation of intact tooth proteins into the simpler substances which can be acted upon by the sulfatases.

This discussion has been limited to a consideration of the chemical factors relating to this hypothesis. There may be

other considerations which are equally pertinent.

These doubts are not to be construed as a criticism of the basic studies performed by this investigator. Dental science must be based upon a large fund of accurate fundamental information.

It is essential that support be continued for studies which may or may not be directly related to the solution of the question of the etiology of dental caries.

The author's name has been deleted from this letter at his request. Anyone wishing to communicate with him may do so through THE JOURNAL*—Editor.*

ON LEVER ACTION OF THE MANDIBLE

Numerous articulators, having either adjustable or nonadjustable "condyle path" movements, have been placed before the dental profession. All such apparatus has been designed on the third formulate of Bonwill that the jaws, in the function of mastication, act as a lever of the third class. Many investigators have shown that Bonwill's third premise is completely inaccurate.

I have endeavored to indicate in my own published work, and by practical demonstrations in Great Britain, that the teeth and jaws act in the manner of a specialized convex-concave inverted mill, and also to show the practical importance of this concept of function.

There is so much confusion in theory and practice, in relation to complete dentures particularly, that it is my conviction that a very great public service would be rendered by a thorough scientific probe. Because theories on which teaching and practice are variously founded have an international range, it would be fitting that an officially sponsored investigation should cover the same wide territory.

In any event, a great public service would be rendered if interpretations of the function of the jaws could be examined and pronounced on by a committee of investigation.

It is probable that many teachers are not satisfied with the prosthetic system which they teach to their undergraduate students. Further, it is readily conceivable that such preceptors would welcome as timely the pronouncements of a committee of referees after it had examined the several divergent theories and technical methods.

Yet further, it is by this or similar means that the dental profession could be enabled to recognize and distinguish that which is empiric from that which is scientifically sound in theory and practice.—*Horace H. Boyle, H.D.D., L.D.S., Fynone Villa, 81 Walters Road, Swansea, England.*

ON DONORA'S SMOG

On page 595 of the Nov. 1949 issue of THE JOURNAL, referring to the Donora Smog Disaster, the statement is made that "Fluoride intake during the period of tooth development of these children was sufficient to cause mottled enamel." This statement is at variance with the summary report of the U. S. Public Health Service for November 1949, in which it is stated that fluoride "intake during the period of tooth development by the 427 children examined was insufficient to cause mottled enamel. Fluoride exposure from sources other than water was insufficient to alter the normal inverse variation of caries attack rate and fluoride content of the communal water." *—Zachary M. Stadt, Dental Health Officer, Charlotte, N. C.*

The reader's information is correct. THE JOURNAL *was in error.—Editor.*

BOOK REVIEWS

The East Greenland Eskimo Dentition, Numerical Variations and Anatomy. By P. O. Pedersen. 256 pages and 30 plates (one in color) of from 2 to 10 dental photographs and x-ray prints per plate. Index. Price $5. Published for The Royal Danish Commission for Scientific Work in Greenland. Copenhagen, Denmark: C. A. Reitzel, 1949.

The author's contact with the Greenland Eskimos began in 1933 as a dentist in the cryolite mining town of Ivigtut in South West Greenland. Three later expeditions of from four to eight months each were made during the period 1935-1939 to Greenland for clinical studies, biochemical work, roentgenologic examinations and impression taking. Ninety-five per cent of the unmixed Eskimo population of East Greenland was examined.

This book is of much value in the study of comparative anatomy, depicting detailed findings in Eskimos' dentition and arch characteristics. Findings of previous investigators are interwoven with the author's studies in an interesting form with details shown in comparative charts. These involve complete description as to form and size of each classification of tooth, together with a study of missing and supernumerary teeth, enamel pearls and variations in the gingival enamel line. The detail of description and the positiveness of all findings indicate the value of the work which has been characterized and formulated on a strictly research basis.

The introduction of the book gives a general description of the Eskimo, his physical and cultural attributes, his mode of life and his contacts with the white man. The author finds definite racial characteristics, which he describes briefly, leading up to the principal aim of his studies, namely "that of scrutinizing the Eskimo dentition for such characteristic features." The significance of dentition as the bearer of racial characteristics is given a definite place in the study of Eskimo anthropology by the author's studies.

The book is printed on a fine grade of paper, with paper cover, and will be a valuable reference to any student of comparative dental anatomy of the various races of man. The bibliography is exceptionally complete.—*Obed H. Moen.*

Cancer. A Handbook for Dentists. Prepared by the Tumor Committee of the Connecticut State Dental Society. 52 pages with illustrations. April, 1948.

In an effort to aid in making available the benefits of a modern knowledge of early lesions of the lips and buccal cavity, this handbook was prepared by the Tumor Committee of the Connecticut State Dental Society. Printing and distribution of the book was accomplished by a grant from the Connecticut State Department of Health and the State Dental Association.

The first chapter deals with the cancer problem in Connecticut and how the state plans to deal with it. Charts and graphs showing cancer incidence of the head and neck in all age groups illustrate that cancer attacks the population regardless of age, sex, or position, indicating that the dentist may make a real contribution by being constantly alert to the possible presence of cancer even in his youngest patients.

Chapter two points out the importance of a periodic dental examination, not only of the physical aspects of the teeth and occlusion, but of the oral cavity and associated structures. In addition to visual examination, a good history, palpation and good roentgenographs are of prime importance. There is a discussion of the various ways in which cancer manifests itself and the necessity of differential diagnosis with a description of some of the lesions that may simulate cancer also is included.

The third chapter deals with the various types of cancer of the skin and is well illustrated. Another chapter describes the malignant neoplasms that are common to the oral cavity including connective tissue tumors, as well as those of epithelial origin. Some of the benign lesions are discussed and a color atlas of forty-two plates showing all types of neoplastic lesions with a history of each case is included. Other points covered in the handbook include biopsy and methods of obtaining tissue for microscopic examination, and treatment. This handbook, while not complete in detail, is well prepared and is a good adjunct to the dentist's knowledge of the problem of cancer.—*Lyle F. Aseltine.*

Industrial Fluorosis: A Study of the Hazard to Man and Animals Near Fort William, Scotland. A Report to the Fluorosis Committee by John N. Agate, G. H. Bell, G. F. Boddie, R. G. Bowler, Monamy Buckell, E. A. Cheeseman, T. H. J. Douglas, H. A. Druett, Jessie Garrad, Donald Hunter, K. M. A. Perry, J. D. Richardson and J. B. de V. Weir. Medical Research Council Memorandum No. 22. 131 pages. London: His Majesty's Stationery Office, 1949.

The unhealthy condition of animals in the neighborhood of aluminum factories located at Ft. William, Scotland, and the knowledge that quantities of fluorine were escaping into the atmosphere, led to this comprehensive study of the fluorine health hazard both within and without the factory area. The report of the results is divided into (1) studies of contamination of human blood, urine and teeth, atmosphere, soil, grass, water, and animal specimens; (2) effects on animals in the area; (3) clinical, radiological, hematological and biochemical findings in selected groups of individuals from the local area; (4) the dental condition of adults and school children in the Fort William area, and (5) physical properties of bone in fluorosis. The appendix includes a good review of the literature on the toxicity of fluorine compounds and a description of analytic methods.

Conclusions derived from the mass of data collected indicate that in the factory the workers inhaled quantities of fluorine sufficient to produce bone changes as demonstrated by roentgenographic examination but none of the workers examined suffered from clinical disabilities. While very considerable quantities of fluorine from the factory contaminate the atmosphere, clinical examination of a small number of residents in the neighborhood produced no signs of injury to health. The fluorine contamination of herbage in the area however was considerable and constitutes a serious impediment to sheep and cattle farming.—*Frank J. McClure.*

The Chemistry of Penicillin. National Academy of Sciences. Editorial Board: Hans T. Clarke, John R. Johnson and Sir Robert Robinson. 1,094 pages with illustrations. Index. Price $36. Princeton: Princeton University Press; London: Geoffrey Cumberlege, Oxford University Press, 1949.

"This monograph represents an attempt to record in detail results of experimental and theoretical studies carried out in a unique, internationally collaborative effort to ascertain the chemical constitution of penicillin and to devise methods for its synthesis," according to the preface.

A truly impressive quantity of data is found in this book even though the objectives of the studies were only partly achieved. The tremendous amount of work recorded in this volume was compressed into a period of slightly more than two years. Much information was obtained concerning the constitution of the several penicillins. (Note the collective nature of the term, penicillin, as it is employed in the title.) No practical procedure for the "chemical" synthesis of these antibiotics was developed but great progress was attained in the "biosynthetic" production of the therapeutically active form.

Nearly seventy authors have contributed to this volume which includes much information contained in the reports to the Committee on Medical Research of the Office of Scientific Research and Development in the United States and to the Medical Research Council in Britain. The appendix provides a list of the individual progress reports which contain information relating to the chemical constitution of penicillin. A footnote in Chapter I states: "A complete file of these reports has been deposited with the U. S. Department of Commerce, Office of Technical Services, from whom reproductions of desired portions can be obtained."

Do not expect this book to be an item for casual reading; it is primarily a reference work which will be most useful to those who contemplate further research in the field of antibiotic substances.—*J. Roy Doty.*

Public Health Law. By James A. Tobey, Dr. P.H., L.L.D. Third edition. 356 pages with 3 appendices. Price $4.50. New York: Commonwealth Fund, 1947.

This book is one of three contributions on the legal aspects of public health and is the only one published since 1926. Charles V. Chapin in the foreward says, "In our complicated civilization, many restrictions must be placed on individual conduct in order that we may live happily and healthfully one with another. Everyone who enters the field of public health, whether it be health officer, volun-

tary worker or just plain citizen should know the health law." Dentistry being one of the health services, dentists who administer these services should be familiar with the literature, the controls, the rules and regulations of community living and our relationships with them.

Public Health Law consists of four parts. Part one deals with the development of public health law, early American health legislation, functions of the various branches of government, the protection of the public health, postal laws and public health, organization of federal health departments, the social security act, radio contributions and similar subjects. It treats police power in public health and its limitations, state and local health organizations, health officers and employees, their qualifications and relationships.

In Part two the author deals with laws concerning powers and duties of health departments, vital statistics, control of communicable diseases, milk control, control of foods, drugs and cosmetics, nuisances and sanitation, legal status of vaccination, school hygiene, industrial hygiene and control of occupational disease.

Part three treats the subject of liability of municipal government, health officers, individuals and corporations in the business of public health. Part four deals with legislation and law enforcement, preparation and adoption of health legislation including functions of legislature, need of public health laws, drafting of bills, ordinances and regulations. It also deals with court procedures.

In all, it gives a comprehensive review of the orderly procedures to protect the public health and should be on the shelf of every dental public health officer, every dental association and dentist.—*Harry Strusser.*

Textbook of Histology. By José F. Nonidez, D.Sc., and William F. Windle, Ph.D., D.Sc. First edition. 456 pages with 287 illustrations. Index. Price, $6.75. New York: McGraw-Hill Book Company, Inc.

One of the greatest difficulties and the great art in teaching of basic sciences to students of the different health services is the selection of material. It is evident that the selection must be different for students in medicine, dentistry and pharmacy. Some textbooks approach the thoroughness of a reference book, some give a bare outline and some stay in between but there are few books which select the material for the special interests of the different professions.

The new *Textbook of Histology* might satisfy many teachers of histology in dental schools although it is not edited with this aim in mind but rather as a general text for the beginner in histology. The book is written in simple and unpretentious language. Many of the illustrations, drawings and microphotographs are well selected and well reproduced. They will be a real help in the interpretation of histologic slides which are stained in the routine methods and which the dental student usually will find in his loan collection. The arrangement of the material more or less follows traditional lines.

Primarily the textbook deals with the morphology of the tissues and organs. Although the physiologic aspect has not been neglected completely, some might have preferred more emphasis on the relation of form and function. Of great help to the student is a list of motion picture films as an appendix at the end of the book.

The book cannot only be recommended for the use in courses in histology in dental schools, but also for the practitioner or the specialist who is interested in refreshing his knowledge of histology as a basis for the understanding of the normal and pathologic physiology.—*J. P. Weinmann, M.D.*

Cancer of the Esophagus and Gastric Cardia. Edited by George T. Pack, M.D. First edition. 185 pages with 162 illustrations, 32 tables and charts. Index. Price $5. St. Louis: C. V. Mosby Company, 1949.

This is a new addition to the growing collection of monographs and volumes dealing with various phases of the cancer problem. This book brings together a collection of experiences by various workers in a relatively new field of radical cancer surgery. The subject matter originally appeared as a symposium in the June 1948 issue of *Surgery*. The contents of the small book is made up of twelve contributions from eleven different sources. Eighteen authors participate in the effort.

This work will be of interest chiefly to those who devote their time to thoracic surgery and it should have background appeal to those who devote their time to oncology. The general surgeon, too, may find stimulation from absorption of information pertinent to diag-

nosis, preoperative and postoperative care, as well as the presentation of data with reference to operative technic.

As would be expected, there is much repetition and some slight differences of opinion. There is far too much reading to be done for the amount of material presented, but it can be no other way, for this offers the truly interested worker divers points of view in a developing field.

The value of this work would have been greatly enhanced had the authors standardized their methods of reporting cases. For example, had each author presented first the total number of cases making up his experience, from which number he would give the number selected for exploration, the number selected for resection, the number of hospital deaths, the number dead of disease, the number living with disease, and so forth. The editor then could have compiled these data to give a fair picture of the present status of cancer of the esophagus and gastric cardia.

This volume offers some of the latest authoritative information dealing with the diagnosis and surgical management of esophageal malignancy. It may be recommended as a worthwhile addition to the library of all teaching institutions.—*S. Gordon Castigliano, M.D.*

Trigeminusneuralgie und Praxis (Trigeminal Neuralgia and the Practice of Dentistry). By Paul Heyden. Zahnarztliche Welt. 43 pages with 6 illustrations. Konstanz, Germany: Zahnarztliche Welt, 1949.

A general review of the various types of trigeminal neuralgias presented in this booklet contains neither case reports nor original contributions. Its merit lies, perhaps, in a clear delineation of the peripheral or symptomatic neuralgias from the genuine or idopathic forms. Diagnostically the difference is not always easy to recognize.

The dentist's skill is concerned with helping to establish the differential diagnosis and with the highly effective therapy in cases of "false" or symptomatic trigeminal neuralgias.

A carefully established history is of primary importance. Painful attacks after eating usually point towards a pulpitis. Hypersensibility to pressure at atypical facial points and inability to sleep almost always indicate a dental origin. The etiology of symptomatic trigeminal neuralgia is many fold. Causes may reside in pulpitis, formation of secondary dentin, pulpstones (denticles), hypercementosis, chronic periapical ostitis, neoplasms in the form of odontoma, adamantinoma, follicular cysts, unerupted teeth and retained roots, postanesthetic damage, osteomyelitis, necrosis, infected wounds, bony spurs, foreign bodies and fractures.

The therapy in symptomatic neuralgias caused by such conditions is the task of the dentist. Postoperative roentgenograms are necessary.

The symptoms in genuine, idiopathic trigeminal neuralgias may be identical to those of symptomatic or peripheral neuralgias. The differential diagnosis requires the services of medical specialists, particularly of neurologists. Major causative factors of genuine trigeminal neuralgias generally are considered to be syphilis, tabes, multiple sclerosis, progressive paralysis, malaria, lead-mercury-arsenic poisoning, arteriosclerosis, vascular spasms at the trigeminal roots and intracranial tumors.

In symptomatic neuralgias the irritation and often the damage of trigeminal nerve branches is primarily due to infection and pressure effects. In idiopathic neuralgias histologic or clinical changes of the trigeminal nerve and of its ganglion have never been established. Sometimes there is evidence of neuritis and of changes in the vascularization of the nerve and ganglion (vasomotor spasms). The true nature of the disease, however, is not understood.

Therapy of idiopathic trigeminal neuralgia must be the task of the neurologist. It consists essentially of alcohol injections into the nerve or its ganglion, tearing the nerve roots, resection and electrocoagulation. Elimination of the cervical sympathetic trunk by procaine hydrochloride injections into the stellate ganglion also has gained favor. Vasoconstricting nerve fibers are presumably eliminated, resulting in an improved vascularization of the trigeminal nerve itself.

A third portion of the review deals with benign and malignant tumors of the oral cavity and of the brain. The former admittedly are of little importance as causative factors in neuralgias. Six reproductions of roentgenograms of such tumors (odontoma, cystic adamantinoma, follicular cyst, sarcoma and carcinoma of the mandible) are given as an appendix.—*A. Zimmermann.*

Medical Etymology: The History and Derivation of Medical Terms for Students of Medicine, Dentistry, and Nursing. By O. H. Perry Pepper, M.D. 263 pages. Index. Price $5.50. Philadelphia: W. B. Saunders Company, 1949.

The origins and derivations of words and not their meanings is the primary concern of this book. It is not a dictionary and inclusiveness is not one of the claims made for it. The author, however, does claim that almost all the word roots the student will meet in his reading will be found in the less than 4,000 terms included. He offers the book to beginning students as an aid in coping with a new terminology.

The material is not original and is available from other sources but the method of presentation is unique, although the influence of Andrew's *A History of Scientific English* seems strong. The terms are listed under the subject where it is expected the student will first meet them. This will cause some disagreement, but an index takes care of any confusion that division by subject may cause.

There are four parts, the first consisting of a background of medical terminology, the use of prefixes, suffixes, compounds, and transliteration, and eponyms and onomatopoetic words. Preclinical subjects, such as anatomy and physiology, are grouped in the second part, clinical subjects, such as surgery and dermatology, in the third, and dentistry in the fourth.

Dr. Pepper considers the 340 terms in the section on dentistry to be a majority of the terms of dentistry proper which require an explanation of their derivation. In this respect the most useful terms are well covered. Dentists will have questions over the inclusion of a few words—anachoresis, syndesmosis and syneresis to mention three.

There is a tendency not to bother anachoresis further, although the term does not appear in any of five dental dictionaries and in only one of four medical dictionaries, after learning that W. D. Miller described the condition in an Austro-Hungarian dental quarterly in 1889. It is not clear, however, why syndesmosis and syneresis do not appear respectively in the earlier anatomy and chemistry lists.

This book is a pleasant introduction to medical etymology and the author's style is well suited to lightening the reader's normally encumbered attitude toward the subject.—*Donald A. Washburn.*

Doctors of Infamy. By Alexander Mitscherlich and Fred Mielke. 165 pages with 16 pages of photographs. Price $3. New York: Henry Schuman, Inc., 1949.

By presenting a collection of documents, the authors illustrate the tragedies of professional men who permitted themselves to be swept by political ideology into organized murder in Germany.

Statements by Andrew C. Ivy, vice-president, University of Illinois, who was nominated by the American Medical Association, by Brig. Gen. Telford Taylor, chief of counsel for war crimes, U.S. Army, and by Leo Alexander, psychiatrist, consultant to the Secretary of War, attest to the fact that atrocities were committed by German physicians throughout the war years.

Citizens of democratic countries will find appalling moment in the words of Dr. Ivy, "The inhuman treatment of Jews served as a propaganda device for the promotion of anti-Christian immoral and unscientific ideology of the inner quality of human beings, or the mythology of the 'Master Race.' During the war it became evident that this mythology was extended to include the Poles, Russians, and Slovenes in such a manner as to constitute genocide (the annihilation of an ethnic group)."

Evidence is presented that the so-called experiments with low pressure and temperature, and euthanasia, that the intravenous injections of phenol and gasoline, and that the attempts of mass sterilization were in reality murders committed under the defense of political expedients and superior orders.

A chapter by Albert Deutsch includes the Geneva version of the Hippocratic oath, the last paragraph of which is designed to prevent recurrences of such politico-mass killings. "I will maintain the honor and the noble traditions of the medical profession. My colleagues will be as my brothers. I will not permit consideration of race, religion, nationality, party politics or social standing to intervene between my duty and my patient. I will maintain the utmost respect for human life from the time of its conception. Even under threat I will not use my knowledge contrary to the laws of humanity."

Yes, a depressing book, but one to be read widely if we are to be forewarned against unconditional obedience to the chilly ways of bureaucracy.—*J. M. Wisan.*

COUNCIL ON DENTAL THERAPEUTICS

COUNCIL LISTS PRODUCTS FOR "ACCEPTED DENTAL REMEDIES"

THE Council on Dental Therapeutics of the American Dental Association announces the inclusion of the following products in the list of *Accepted Dental Remedies:*

Anesthetics—Local—Slightly Soluble[1]

Amylsine-Benzocaine Ointment: Each 100 Gm. is stated to contain amylsine base, 4 Gm.; benzocaine, 20 Gm.; clove oil, 2 Gm., in a lanolin-petrolatum base.

Amylsine-Benzocaine Solution: Each 100 Gm. is stated to contain amylsine base, 4 Gm.; benzocaine, 18 Gm., clove oil, 37 Gm., and wintergreen oil.

Manufactured by Novocol Chemical Mfg. Co., Inc., Brooklyn. (Trademark: A.B.N.)

Antibiotics and Antiseptics[2]

Penicillin Potassium Tablets (Soluble) 100,000 Units: Stated to contain crystalline penicillin G potassium, stearic acid, sodium bicarbonate and sodium benzoate. In bottles of 12 and 100.

Penicillin Potassium Buffered Tablets, 250,000 Units: Stated to contain crystalline penicillin G potassium, calcium carbonate, cane sugar, corn starch, acacia, talc and magnesium stearate. In bottles of 12.

Penicillin Potassium Buffered Tablets, 500,000 Units: Stated to contain crystalline penicillin G potassium, calcium carbonate, cane sugar, corn starch, acacia, talc and magnesium stearate. In bottles of 12.

Manufactured by Abbott Laboratories, North Chicago, Ill.

Penicillin Dental Cones: Each cone is stated to contain calcium penicillin, 5,500 units, and milk sugar, 34.4 mg.

Manufactured by Proco-Sol Chemical Co., Inc., Philadelphia.

Penicillin-Sulfanilamide Cones, 10,000 Units: Each cone is stated to contain crystalline penicillin sodium, 10,000 units, and sulfanilamide, 0.5 grain. In packages of 50 and 100 cones.

Manufactured by Novocol Chemical Mfg. Co., Inc., Brooklyn.

Quaternary Ammonium Compounds[3]

Anzol Solution: Each 100 grams is stated to contain benzethonium chloride, 0.25 Gm.; potassium nitrite, 0.27 Gm.; sodium carbonate, 0.15 Gm.; sodium bicarbonate, 0.30 Gm., and water.

Manufactured by Veltex Company, Birmingham, Ala.

1. *A.D.R.*, ed. 14, p. 57.
2. *A.D.R.*, ed. 14, p. 59.
3. *A.D.R.*, ed. 14, p. 94.

Ammonia Derivatives[4]

Diammonium Phosphate Crystalline, Diammonium Phosphate Powdered: Brands of dibasic ammonium phosphate.

Diammonium Phosphate Powdered (with 1% Caking Inhibitor): Dibasic ammonium phosphate with 1 per cent dicalcium phosphate—A.D.R. added.

Manufactured by Monsanto Chemical Company, Anniston, Ala.

Admission to *Accepted Dental Remedies* means that the product was found to conform to the rules of the Council when it was accepted. Accepted products are reconsidered periodically. The files of the Council contain information on many drugs and dental cosmetics, and inquiries are welcomed.—*Donald A. Wallace, Secretary.*

4. *A.D.R.*, ed. 13, p. 48.

PRELIMINARY COMMENTS ON DENTAL PRODUCTS

The following statements concerning products which are not accepted by the Council on Dental Therapeutics are designed to be free from controversial opinions. The Council may publish comprehensive status reports on these products whenever such reports are warranted, and will accept those which are found to be eligible for acceptance.

Dentammo-NH_4 Brand Ammonia Liberating Tooth Powder

Dentammo-NH_4 Brand Tooth Powder is stated to contain carbamide (urea), 28 per cent and dibasic ammonium phosphate, 5 per cent, plus synthetic detergents and natural flavors. According to the label, it is a "daily aid for control of tooth decay." The label also states that a U. S. patent is pending.

An advertising folder states, "Jamco Co. has incorporated in Dentammo-NH_4 Brand the optimum percentage of carbamide 28 per cent and dibasic ammonium phosphate 5 per cent plus a detergent to dissolve the plaque to give the maximum results in aiding in the prevention of caries. . . . (it) possesses this dual action which makes it distinctive from most other dentifrices." Most ammoniated dentifrices contain carbamide, dibasic ammonium phosphate and synthetic detergents.

The folder states further, "Its effectiveness has been proven in clinical trials and bacteriological examinations by competent authorities." Publications on products similar to Dentammo-NH_4 Brand Tooth Powder have appeared in the scientific literature.[1,2] Evidence relative to the possible effectiveness of Dentammo-NH_4 Brand Tooth Powder itself has not yet come to the attention of the Council, although the distributing firm stated in a letter dated June 10, 1949, ". . . clinical evidence and bacteriological tests up-to-date will follow shortly."

1. Council on Dental Therapeutics, American Dental Association, Status of Amm-I-Dent Tooth Powder. *J.A.D.A.* 38:642 (May) 1949.

2. Henschel, C. J., and Lieber, Leon, Relative Efficacy of 27.5 Per Cent Ammonium Therapy Dentifrice. *J. D. Res.* 27:715 (Dec.) 1948.

Dentrix Dental Cream, Tooth Powder and Mouth Rinse

Dentrix Tooth Powder and Dentrix Ammoniated Dental Cream are stated to contain dibasic ammonium phosphate, 5 per cent, and urea, 3 per cent. According to the distributing firm, Dentrix Mouth Rinse is similar to the formula developed by Kesel and his associates.[3,4] The dental cream is stated to have a pH of 8 and to be only mildly abrasive.

The advertising contains many references to dental caries. Preparations of this type have not been shown to prevent dental caries, although the preliminary results indicate that a tooth powder and mouthwash containing dibasic ammonium phosphate and urea may be responsible for reducing the *Lactobacillus acidophilus* count in many, but not all, caries-susceptible persons.

Evidence relative to the possible effects of Dentrix Dental Cream itself has not yet come to the attention of the Council.

The distributing firm has initiated a scientific investigation of these products and has cooperated with the Council by supplying partial information concerning the composition of its products.

For more detailed information concerning this class of products, see "Status of Dentifrices and Mouthwashes Which Contain Dibasic Ammonium Phosphate and Urea" *J.A.D.A.* 35:504 (June) 1948.

Pyrozide Ammoniated Tooth Paste

This product is stated to contain dibasic ammonium phosphate, carbamide (urea), tricalcium phosphate and sodium lauryl sulfoacetate.

The usual letter of inquiry was sent to the firm in July 1949, but a quantitative statement of composition was not supplied.

According to the package, "Pyrozide Ammoniated Tooth Paste helps retard tooth decay, . . ." The firm states, "We make no claims as to the medicinal qualities of Pyrozide Ammoniated Tooth Paste," and also that the product is not advertised to the public.

Although there is preliminary evidence to indicate that dentifrices which contain dibasic ammonium phosphate and urea may be partially effective in preventing tooth decay, evidence that Pyrozide Ammoniated Tooth Paste itself is effective for this purpose has not come to the attention of the Council.

For more detailed information concerning this class of products, see "Status of Dentifrices and Mouthwashes Which Contain Dibasic Ammonium Phosphate and Urea," *J.A.D.A.* 36:504 (June) 1948.

3. Kesel, R. G., The Biological Production of Ammonia in the Oral Cavity in Relation to Dental Caries Activity. *North-West Den.* 27:127 (July) 1948.

4. Kesel, R. G., and others, Recent Developments in the Biologic Production of Ammonia and the Use of Ammonia and Carbamide in Caries Prevention. *Oral Surg. Oral Med. & Oral Path.* 2:459 (April) 1949.

CASES AND COMMENTS

Removal of Impacted Molar Assists in Diagnosis of Brucellosis.

By C. W. Newman, D.D.S., Chief, Dental Service, V.A. Hospital, Indianapolis.

This case is reported to show an instance in which removal of an impacted molar from the maxilla assisted in the diagnosis of brucellosis and in recovery of the patient. The patient, a white man 34 years of age, who was a meat inspector, was admitted to the hospital April 28, 1948, for treatment of iritis of the right eye. The patient complained of pain in the right eye, of insidious onset, about one week prior to admission. The eye became injected and the pain more severe. There had been a similar episode about one year prior to hospitalization. Additional history disclosed that the patient had suffered from "nervous stomach" in 1942 while in military service. The family history was non-contributory and the patient denied any illness other than the ones mentioned.

Examination

Physical examination revealed a well developed, well nourished white male who did not appear to be acutely or chronically ill. His height was 68 inches, weight 195 lbs., and blood pressure 125/80. Examination of the right eye revealed a markedly constricted pupil and the iris was markedly engorged. There was moderate injection of the conjunctiva. Examination of the ear, nose and throat disclosed marked deviation of the nasal septum to the right, ethmoiditis and right maxillary sinusitis. The remainder of the examination disclosed no significant findings.

Hematologic examination showed the red blood count to be 4,100,000 with 13.6 Gm. hemoglobin; white blood count 9,500 with a normal differential count. Urine and serologic tests gave essentially negative results. Repeated routine agglutinations disclosed a positive reaction for Brucella abortus in the dilution 1:5120. Two blood cultures were negative. Roentgenograms of chest and a G.I. series revealed no abnormal findings. Roentgenograms of the mouth revealed an area of infection around the upper right third molar which was impacted.

The eye consultant expressed the opinion that the patient was suffering from brucellosis and that the iritis was an allergic phenomenon dependent upon the systemic infection.

Course

The patient's hospital course was entirely afebrile. On May 13, 1948, the upper right impacted third molar was removed and a gelatinous substance was found in the follicle around the tooth. This gelatinous substance was cultured and Br. abortus was isolated. The patient was then treated with streptomycin, 2.0 Gm. per day for seven days and sulfadiazine, 1.0 Gm. every four hours for eighteen days. The right maxillary sinus was irrigated and showed definite improvement. On June 3, 1948, the iritis showed almost complete resolution. On June 6, 1948, the patient was released apparently cured, and his return for further examination at the end of one month was arranged. Upon his return, 71 days after hospitalization, he had no complaints and the iris was found to be normal.

Discussion

The rapid recovery is described of a patient with iritis, after surgical removal of an impacted third molar and its associated follicular cyst from which Br. abortus was cultured, together with specific therapy with streptomycin and sulfadiazine. A positive agglutination reaction of the blood for brucella is not diagnostic of active infection, but is considered only presumptive, even when associated with clinical evidence of disease. The test may be positive during convalescence from active disease or following recent exposure to infective material. This has been observed repeatedly in veterinarians, packing house workers, and breeders of livestock who have never demonstrated clinical evidence of disease. Isolation of the organism upon culture, usually of the

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blood, generally is considered necessary to establish the presence of active infection. In the case presented, the usual cultural methods were not helpful and the crucial laboratory confirmation rested upon isolation of the organism from the exudate from the follicular cyst. We believe this is the first recorded instance of the isolation of brucella organisms from this site.

This case suggests that focal brucellar lesions, dental in location, should be added to the list of localized brucellar infections previously reported, and that oral surgical procedures may be required to effect a cure.—*2601 Cold Springs Road.*

Conductive Impression Material: The Formula. By Clarence B. Frankel, D.D.S., Brooklyn.

In view of the numerous requests received regarding the modified formula of a conductive impression material,[1] formerly available under the name "Electrocompound," it may be of interest and value to the profession to have the formula and instructions for compounding this material. All of the constituents are available at any manufacturing chemist.

Graphite (Acheson 38)	54.2% by weight
Electrolytic copper dust	1.4
Paraffin (M.P. 52° C.)	24.6
Paraffin (M.P. 60° C.)	15.6
Candelilla wax	2.5
Ozokerite	1.6
Powdered rosin	0.1 (trace)

Thoroughly melt paraffins, candelilla wax, ozokerite and powdered rosin in a double boiler. Then slowly add graphite and copper dust, constantly stirring until all is incorporated and a homogeneous thick paste is obtained. Spread paste on a large glass slab, cover with another slab and compress until the mass is ¼ inch thick. Chill slightly and cut into strips ¼ inch wide with a hot knife. The use of this material is as previously described.[1] If preferred, Aquadag[2] (a colloidal suspension of graphite in water) may be used as a surface coating instead of silverized copper dust as published.

1. Frankel, C. B., A Scientific Approach to the Solution of Practical Problems Encountered in Electroforming Copper Dies. *J.A.D.A.* 32:1130 (Sept.) 1945.
2. Acheson Colloid Co., Port Huron, Mich.

The Removal of an Impacted Lower Left Third Molar and Sequelae: Report of a Case. By M. Hillel Feldman, D.D.S., New York.

Fig. 1

A routine roentgenographic examination of a 17 year old male, on November 18, 1938, disclosed (Fig. 1) that the lower left third molar was lying in a horizontal relationship to the distal wall of the second molar. The condition was not treated until March 18, 1944 when the patient complained of discomfort in that area.

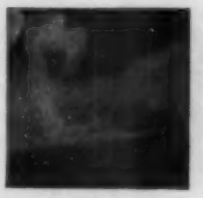

Fig. 2

An extraoral roentgenogram showed the impacted tooth had moved and was exerting pressure on the distal aspect of the second molar. While operating to remove the third molar, pains were taken not to injure the second molar even though the crown of the impacted tooth had buried itself in the body of the second molar (Fig. 2).

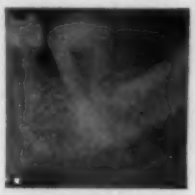

Fig. 3

Postoperative symptoms were excellent; the second molar was firm and responded well to vitality test, and on August 3, 1948 the area was again examined. A roentgenogram (Fig. 3) showed an unusual regeneration of tissue where the tooth root had been destroyed by the impacted molar. The second molar was sound and in no way damaged or impaired in masticatory efficiency.—*730 Fifth Avenue.*

Arrest of Gingival Hemorrhage With Vitamin C: Report of a Case. By Harry Roth, D.D.S., Assistant Professor of Periodontia, New York University College of Dentistry, New York.

A white schoolgirl, 15 years of age, came to the periodontia clinic September 18, 1948,

complaining of gingival bleeding during toothbrushing, the presence of blood on her pillow every morning for the past year, spontaneous gingival bleeding and severe mouth odor.

History and Physical Examination.—The patient had been undergoing orthodontic treatment since 1946. Hypertrophy had been present since before that time but gingival hemorrhage had increased with the progress of treatment.

The family physician reported that the health of the patient was normal in every respect except for a congenital malformation of the heart, but that this condition was under control. The patient had been cautioned to refrain from excessive exercise.

Examination of the oral cavity revealed the mucosa to be normal in appearance. There was a copious flow of thin, clear saliva; the arch was U-shaped; there were deep overbite and extreme malposition, and the lower anterior teeth were crowded. Gold orthodontic bands were on all of the molar teeth and a maxillary bite block was in position.

There was Class I mobility, on both sides, of all the incisors and of the first molar; and in the mandible, on both sides, of the incisors, first and second bicuspids and first molar. Vitality of the teeth was unimpaired. The labial and lingual gingivae were dark red in color, edematous and hypertrophic, with pain and bleeding on palpation. The proximal gingivae were edematous and hypertrophic. Deep gingival pockets were present on the labial aspect of the lower anterior teeth.

Fig. 1.—Shows appearance of gums when patient was first seen at the clinic. There had been gingival hemorrhage with blood on the pillow every morning for the past year.

Fig. 2.—Same patient as Fig. 1. After the third day of administration of 500 mg. of vitamin C blood no longer appeared on the pillow in the morning. Hemorrhage ceased completely after three months of daily administration of 500 mg. vitamin C and then routine periodontal treatment

Roentgenographic Examination. — Roentgenographic examination revealed nothing unusual.

Diagnosis and Treatment.—A diagnosis of hypertrophic gingivitis was made. On September 26, vitamin C therapy was initiated, 500 mg. daily being administered perorally.

Course and Results.—One week later the patient reported that after three days the spontaneous bleeding had stopped and there was no blood on the pillow. Vitamin C administration was continued until December 11, 1948 and there was gradual improvement in tone. The patient continued to wear the orthodontic bite plate, but bleeding from the gingivae did not recur.

Comment

A detailed discussion of the effect of vitamin C deficiency is beyond the scope of this report. However it has been shown that deficiency states can be precipitated clinically by local traumatic factors. In the present case, the added strain on the periodontium caused by the bite plate may have produced the marked bleeding by increasing the tissue requirement of vitamin C. The daily administration of 500 mg. of vitamin C has resulted in the arrest of hemorrhage.—*156 East 52nd St.*

A Case of Lichen Planus. By Ralph R. Mezrow, Merion, Pa.

A white married woman, 58 years of age, came to this office on April 21, 1948, complaining of pain in her cheeks on eating hard crusts of bread. She had been sent by her dentist who requested diagnosis, prognosis and a course of treatments for a lesion in the oral cavity.

Three months ago she had visited her dentist with the desire to have 13 remaining teeth, which were affected by periodontoclasia, removed and replaced by a denture. After examining the lesion, the dentist had refused to extract the teeth until consultation with the patient's physician. The physician, after examining a smear from the mouth, could arrive at no diagnosis. Consequently the dentist extracted the remaining teeth and treated the lesion symptomatically for three months with no improvement.

Examination of the mucosa of the edentulous oral cavity revealed a lacy network of white, keratinized grayish strands, with the lumen of each reticulum somewhat erythematous. On palpation, the strands felt keratinized and scaly. The lesion was spread on the buccal mucosa of both cheeks, the mucobuccal fold of the maxilla, the mandible, and more scantily on the alveolar crests of the edentulous maxilla and mandible. The tongue showed white coalescent areas bilaterally on the dorsum, but not keratinized as on the cheek (Fig. 1, 2).

The past and present family history was essentially negative, no other members of the family having had similar lesions.

Urinalysis was normal and serologic tests gave negative results. Bacteriologic smears and

Adjunct attending oral surgeon, Sydenham Hospital, New York; Instructor in Oral Pathology, Temple University School of Dentistry.

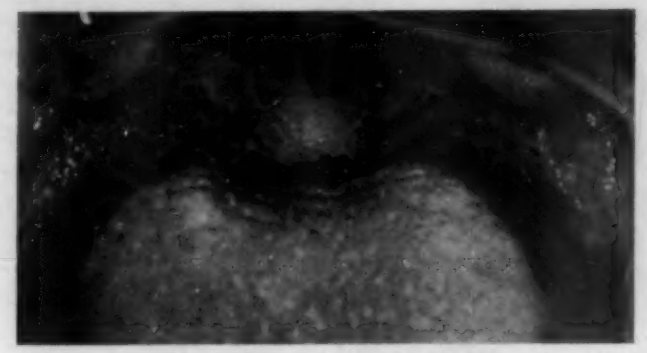

Fig. 1.—Edentulous oral cavity, showing lacy network of white, keratinized grayish strands. Diagnosis of lichen planus was made clinically and verified histologically

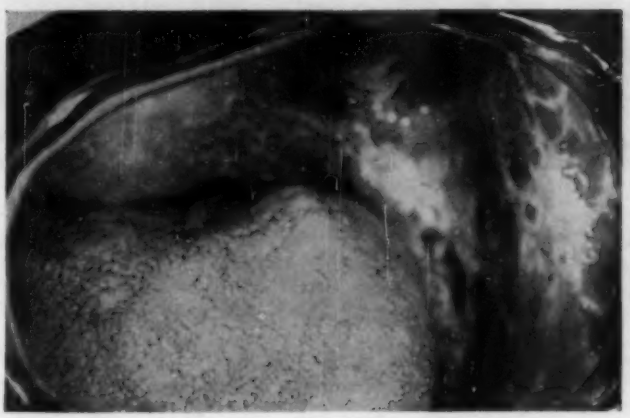

Fig. 2.—Same oral cavity as in Fig. 1, showing the white coalescent areas bilaterally on the dorsum of the tongue

cultures revealed only the normal bacterial flora.

A clinical diagnosis of lichen planus was made, but in order to verify it a biopsy of portion of the lesion was taken by means of an electrosurgery knife.

The pathologist reported the following findings:

Gross.—The specimen is a round soft mass measuring 1.0×1.0×0.5 cm. There is also a smaller section measuring 0.5×0.5×0.3 cm.

Microscopic examination.—The specimen is composed of two small sections of tissue. Under low power examination the bulk of each section is composed of an embryonic type of fibrous connective tissue which is tremendously invaded and infiltrated by round cells. The epithelial layer covering the connective tissue is slightly hyperplastic but has lost much histologic evidence of varying layers. The entire epithelial layer manifests parakeratotic change. On examination under the high power microscope we observe that most of the inflammatory cells are lymphocytes. Some plasma cells are also discernible. Evidence of some exudate adjacent to the basal layer of epithelial cells is noted. Pseudocystic spaces are noted between the basal cells and the exudate (Figs. 3, 4).

In view of these findings a diagnosis of lichen planus would be suggested.

Comment

The etiology of this disease is not known definitely but it is thought to be neurogenic. The latter theory would be substantiated in this case by the fact that the woman worried persistently about her son who was in the armed service, and consequently her weight dropped from 187 to 142 pounds.

Although the lesion is benign, several cases are reported which have become malignant.

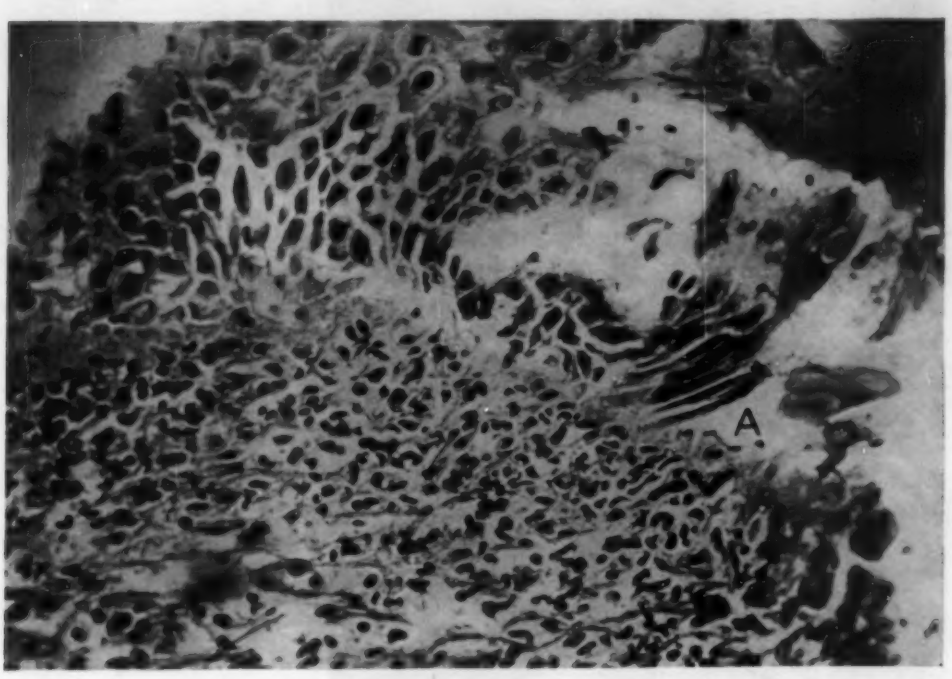

Fig. 3.—Section of biopsy specimen from which diagnosis of lichen planus was made. The presence of pseudocystic spaces (A) between the inflammatory exudate and the basal layer of the epithelium is one of the histologic characteristics of the lesion

Fig. 4.—Lichen planus. Section of biopsy specimen showing (A) parakeratosis, (B) acanthosis, (C) closely related exudate to basal layer epithelium, and (D) marked chronic inflammatory manifestation in the corium

A differential diagnosis should be made between this disease and leukoplakia which is precancerous.

The therapeutic regimen must be planned with specific attention to the nervous system. Therapeutic doses of thiamine chloride, riboflavin and nicotinamide should be administered. In some instances the use of the barbiturates would be indicated. Bland mouth rinses of sodium bicarbonate are suggested and the complete prohibition of irritating foods and tobacco.—*6 Old Lancaster Road.*

CURRENT LITERATURE

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A Study of Novocain Sensitivity Among Navy Dental Officers. W. V. Charter, C. A. Schlack and R. L. Ware.

It is common knowledge that some individuals experience allergic conditions following the handling or administration of procaine. These conditions may occur regularly or occasionally and both the frequency and severity are influenced by the amount of exposure and the method of administration. Since the symptoms vary in intensity and duration, many questions have arisen concerning not only the percentage of dentists who are sensitive to procaine, but also the amount of operating time lost by these individuals. This is an important problem to consider in preparing dental logistical studies in the Navy.

In order to ascertain the size of the problem, a questionnaire was planned that would elicit the desired information. Approximately 7,500 were mailed to both regulars and reserves and of this number approximately 4,000 were completed and returned. Approximately 3 per cent of the individuals returning the forms said that they had at some time experienced procaine sensitivity symptoms. A detailed study was made of the relationship of such variables as age, year of last attack, type of symptoms, severity and frequency of symptoms. Based upon the answers, there does not appear to be either a serious medical or manpower problem associated with procaine sensitivity among Navy dental officers.

Compressive Strength of Amalgam as Related to Time. Ralph W. Phillips.

Six popular alloys were studied in order to determine their compressive strength as it is related to time. Crushing strength was tested at various time intervals ranging from half an hour to six months.

It was found that amalgam, though quite weak during the first few hours, rapidly gains its strength and generally reaches approximately 85 per cent of its maximum strength by the end of the first eight hours. The compressive strength thereafter continues to increase gradually up to the sixth-month final test. Hardness measurements verified these findings.

These crushing strength measurements can probably be associated with the setting reactions and indicate that equilibrium in amalgam is not reached for an indefinite period of time.

Experimental Studies in Calcification. VII. Dentinal Changes in the Incisor of the Nephrectomized Rat. J. T. Irving, J. P. Weinmann, I. Schour and W. R. Tweedy.

The study is based on the histologic analysis of the upper incisors of 9 control and 17 experimental albino rats. The experimental animals were subjected to bilateral nephrectomy and both the controls and the experimental rats were then starved and sacrificed after 48 hours.

It was found that the dentin in the experimental animals showed the characteristic calciotraumatic response, which was most marked in the middle third of the labial side of the incisor.

Using the experimental dentin line as a landmark, measurements showed that whereas in the controls the rate of dentin apposition was retarded (probably due to starvation), in the experimental animals the dentin apposition was accelerated.

In some cases, the nephrectomized rats showed ectopic calcifications of the pulp.

Experimental Studies in Calcification. VIII. The Effect of Large Doses of Calciferol on the Dentin of the Incisor in Normal and Nephrectomized Rats. James T. Irving, Joseph P. Weinmann, Isaac Schour and Wilbur R. Tweedy.

This study deals with the effect of large doses of calciferol on the dentin and pulp of the upper incisors in 9 normal and 38 nephrectomized rats. Calciferol given to normal animals accelerated the rate of calcification, but did not alter the rate of formation of dentin. Nephrectomy alone is known to accelerate the rate of dentin formation. When calciferol was given to nephrectomized rats it was found that the accelerating influence of nephrectomy on dentin formation was unaltered, but the accelerating effect of calciferol on the calcification of predentin was lost. Injections of calciferol in normal animals, although they raised the blood calcium level, failed to produce any calcifications in the pulp. However, nephrectomized rats were shown previously to develop ectopic calcifications of the pulp, in spite of normal blood calcium level. Administration of calciferol did not increase the incidence of ectopic calcification of the pulp in nephrectomized rats. These findings, therefore, would indicate that ectopic calcifications are a consequence of focal necrosis due to phosphorus retention after nephrectomy.

Experimental Studies in Calcification. IX. The Effect of Parathyroid Extract on the Dentin and Pulp of the Incisor in Normal and Nephrectomized Rats. James T. Irving, Joseph P. Weinmann, Isaac Schour and Wilbur R. Tweedy.

This study deals with the effect of parathyroid extract on the dentin and pulp in the upper incisors of 10 normal and 27 nephrectomized rats. Large dosage of parathyroid extract in normal animals retarded the rate of dentin formation. Nephrectomy has previously been shown to accelerate the rate at which dentin is formed. Injections of parathyroid extract to nephrectomized rats were found to reduce the stimulating influence of nephrectomy on dentin formation.

After injections of parathyroid extract, ectopic calcification in the pulp was a regular occurrence. These calcifications were due to the focal tissue degeneration resulting from the toxic effect of parathyroid extract.

An Aspect of Diffusion; Its Possible Association with Dental Caries. F. C. Besic.

It was shown that molecules and ions in solutions diffuse slowly into the region around the contact points of spherical solid bodies immersed in liquid. The limits of retardation of diffusion of particles in these regions were demonstrated by using various concentrations of acid and other solutions to react with steel and other spheres in contact with each other. The introduction of foreign substances (salts, protein, etc.) to solutions alters the phenomenon somewhat.

Dental decay begins in regions which simu-

late the areas where experimentally diffusion of molecules and ions is retarded. It is suggested that teeth decay when the physical and chemical characteristics of saliva and the shape of teeth are such that diffusion of protective ions and molecules into "contact" areas is slower than the rate of their loss in those regions. Experiments indicate that this phase of diffusion exists *in vivo* in the human mouth.

Acid Production in Saliva In-Vitro Experiments. T. J. Hill and B. J. White.

Saliva in *in vitro* experiments does not produce acid as rapidly as it is produced in the mouth. Because sugar is cleared from the mouth in a relatively short time, the rate of acid production in saliva-sucrose mixtures was studied for ninety minutes only. In these studies acid production, at a rate comparable to that in the mouth, was obtained from concentrated centrifugates of saliva. Comparable rates were not observed when large numbers of lactobacilli were added to Seitz filtrates, high speed supernatants or untreated portions of saliva. Unaltered filtrates, supernatants and salivas subjected to ultrasonic vibration were incapable of producing acid from sucrose. Lactobacilli added to the latter preparation resulted in formation of a small amount of acid.

These experiments suggest there is some feature of saliva associated with the residual matter after centrifugation or filtration, which influences the rapidity of acid production from sucrose. Saliva subjected to a period of ultrasonic vibration behaves similarly to Seitz filtrates or high-speed supernatants.

The Evanston Dental Caries Study. III. A Preliminary Study of the Distribution of Fluorine in Communal Water Supplies in the United States. I. N. Hill, O. E. Jelinek and J. R. Blayney.

This paper was initiated and prepared to show: (1) the approximate location of areas where fluorine is prevalent in communal water supplies, and in what strengths, (2) the number of people in the United States who are drinking, or have access to, a communal water supply in which fluorine is a natural constituent. The material for this study was obtained from the chief sanitary engineers of each state health department and the District of Columbia, and the data were segregated into four groups: (1) those listing fluorine content of communal water supplies in cities, towns and villages, (2) those now conducting fluorine determinations on communal water supplies, (3) those showing all water supplies to be free from fluorine, and (4) those showing fluorine content of rural areas which were not considered in our tabulations.

The municipalities having a high fluorine content are found in nine states, with the greatest number in Texas and the next greatest in South Dakota. There are approximately 5,646,897 people in the United States having access to a communal water supply containing fluorine in the amount of 0.5 parts per million or more. A total of 2,195,115 people are in the fluorine concentration bracket of 0.9 to 2.0 ppm. In the 2.1 to 3.0 ppm bracket there are 626,177 persons. In a still higher concentration of 3.1 to 5.0 ppm there are 127,243 people. Municipalities of high fluorine content, 5.1 ppm and higher, number only 25 and the number of people (40,151) exposed to a high level of fluorine is not great.

Geographic Variations of Dental Caries in Oregon. I. Dental Status of Native Born and Reared School Children in Two Regions. Demetrios M. Hadjimarkos and Clara A. Storvick.

On the basis of a previous investigation (J. D. Res. 27:299, 1948) two geographic regions within the state of Oregon were selected for further study as representing a high and a low area of caries incidence. In the Coast region the counties of Clatsop and Coos were investigated, and in the Central Oregon region the counties of Deschutes and Klamath.

Dental examinations by means of mouth mirror and explorers were given to 741 native born and reared (as defined in the text) white school children of 14, 15, and 16 years of age. The findings revealed that: (1) A difference of varying degree exists in the incidence of dental caries among school children living in two regions of the state, and that the more pronounced disparity was observed between Clatsop county (14.4 DMF teeth) and Klamath county (9.0 DMF teeth). (2) The dental caries experience of school children in both regions was found to be higher than that of subjects of the same age groups examined in other parts of the country. (3) Girls experienced higher rates of caries attack and also had received more dental care

than boys. (4) No cases of enamel hypoplasia were discovered among the subjects examined.

The Effects of a Caries Producing Diet Initiated at Various Stages of Pre- and Post-natal Development of the Hamster. David F. Mitchell and William G. Shafer.

Eleven pregnant female hamsters were placed into categories distinguished by the pre- or postnatal age at which they or their offspring were started on a caries producing diet (CPD). All received Purina Laboratory Chow (fluorine 18 ppm by analysis) until the CPD was initiated. The CPD was begun at intervals ranging from 12 days before delivery to 30 days after birth. All offspring were fed CPD pre- and/or postnatally for 90 days; postnatal age at sacrifice ranged from 78 to 120 days. In general, female caries experience paralleled that of males but at much lower levels. Average scores were as follows: *Prenatal groups*—Twelve days: 5 males—50, 2 females—4. Five days: 9 males—1, 11 females—1. Two days: 3 males—3, 5 females—0.5. *Postnatal groups*—Six days: 4 males—21, 2 females—9. Fourteen days: 2 males—101, 3 females—32. Thirty days: 3 males—142, 2 females—35.

With the exception of the first group, caries appeared to increase as age at initiation of diet (and at sacrifice) increased.

The same organizational set-up was run with 46 other animals. Fluorine (40 ppm from NaF) was added to the CPD. No caries was found in any animal after 90 day exposure periods. Frequent enamel fractures were evident in this group.

A Progress Report on the Bacteriologic Aspect of the Caries Research Program, College of Dentistry, University of California. V. Hurst, P. Mullett, H. E. Frisbie, J. Nuckolls and M. S. Marshall.

Attempts to isolate organisms from microscopic carious lesions indicated that this was not a promising method for determining the primary etiologic organism of caries. In the present study, tests are being made on the ability of various oral bacteria to produce microscopic carious lesions in unerupted hamster molars *in vitro*. Bacteria not common among the oral flora are being used as controls. Histologic examinations of twenty molars testing the oral actinomycetes and lactobacilli are now complete. Broth cultures of both the lactobacilli and the actinomycetes have produced microscopic carieslike lesions at a neutral pH. Dextrose broth cultures of lactobacilli which had a terminal pH 3.5 to 4.0 caused a complete dissolution of the enamel and a resultant histopathologic picture totally unrelated to caries. These results suggest that the cariogenic properties of the lactobacilli may not be related solely to their acidogenic properties, and that caries may result from the action of more than one type of organism.

DEATHS

Able, Arthur G., Easton, Pa.; School of Dentistry, University of Pennsylvania, 1901; died September 14.

Agnew, Fred L., Rochester, N. Y.; School of Dentistry, Temple University, 1907; died September 3; aged 67.

Bain, Seneca B., Silver Spring, Md.; Dental Department, National University, 1898; died September 3; aged 75.

Baker, Ralph K., Springtown, Ark.; Chicago College of Dental Surgery, 1903; died August 8; aged 78.

Beiser, H. Everett, New York; New York College of Dentistry, 1914; died September 22; aged 68.

Bennett, Paul E., Toledo, Ohio; School of Dentistry, Western Reserve University, 1919; died September 11; aged 54.

Berry, Goebel D., Barnesville, Ga.; died August 29.

Bieberbach, Max W., Philadelphia; School of Dentistry, Temple University, 1894; died September 19; aged 77.

Borthwick, Ernest G., Eau Claire, Wis.; Dental School, Marquette University, 1917; died September 5; aged 54.

Chadwick, John E., Shelbyville, Ind.; Cincinnati College of Dental Surgery, 1902; died September 4; aged 69.

Coy, Lee F., Boston; Dental School, Tufts College, 1908; died September 13; aged 63.

Cushman, Robert N., Springfield, Mass.; Pennsylvania College of Dental Surgery, 1904; died February 22.

Dougherty, Michael E., Britt, Iowa; College of Dentistry, Creighton University, 1919; died August 30; aged 53.

Ellard, Edward S., Lawrence, Mass.; Dental Department, Baltimore Medical College, 1905; died September 7; aged 65.

Gibbon, William E., Amarillo, Texas; College of Dentistry, Baylor University, 1938; died July 17; aged 34.

Gillespie, Robert H., Little Rock, Ark.; died September 14; aged 62.

Glover, Sterling R., Rush Springs, Okla.; School of Dentistry, Vanderbilt University, 1908; died August 10; aged 64.

Gordon, Warren J., Houston, Texas; Texas Dental College, 1926; died August 28; aged 44.

Green, Harry C., Brooklyn; New York College of Dentistry, 1899; died September 8; aged 83.

Gunter, John H., Philadelphia; School of Dentistry, University of Pennsylvania, 1910; died September 23; aged 61.

Haganour, Henry C., Akron, Ohio; Baltimore College of Dental Surgery, 1900; died August 18; aged 69.

Hall, Claude H., Weslaco, Texas; Atlanta Dental College, 1899; died January 2; aged 72.

Halsted, Nell, New York; New York Dental School, 1901; died September 15; aged 70.

Held, August W., Vincennes, Ind.; School of Dentistry, Indiana University, 1902; died September 4; aged 72.

Henderson, William B., Dallas, Texas; St. Louis Dental College, 1905; died March 11; aged 65.

Higgins, John A., Blue Island, Ill.; Chicago College of Dental Surgery, 1929; died September 13; aged 59.

Holley, John C., Macon, Ga.; School of Dentistry, Temple University, 1914; died August 29.

Holliman, Henry H., Harriman, Tenn.; died September 9; aged 64.

Hosea, Ernest, Fairlee, Vt.; died August 29; aged 75.

Howson, Thomas E., Saginaw, Mich.; College of Dental Surgery, University of Michigan, 1892; died September 3; aged 84.

James, John A., Madisonville, Texas; Texas Dental College, 1932; died July 29; aged 40.

James, Wesley L., Galveston, Texas; State Dental College, 1918; died August 20; aged 57.

Jones, Andrew, Atlanta, Ga.; Atlanta-Southern Dental College, 1943; died July 3; aged 33.

Kells, Walter D., Boston; Dental School, Tufts College, 1916; died in September.

Klob, James C., La Junta, Colo.; Chicago College of Dental Surgery, 1923; died September 9; aged 52.

Kyle, Frank H., Venice, Calif.; died August 30; aged 73.

Lady, William F., Washington, D. C.; School of Dentistry, Georgetown University, 1925; died September 5; aged 76.

Leavitt, Nathan C., Philadelphia; Medico-Chirurgical College of Pennsylvania, 1911; died September 1.

Leonard, Thomas E., Somerville, Mass.; Dental School, Tufts College, 1923; died January 23; aged 56.

Lynch, John J., Cranford, N. J.; School of Dentistry, Temple University, 1948; died September 4; aged 24.

MacWithey, Harold S., North Miami, Fla.; Chicago College of Dental Surgery, 1926; died September 23; aged 52.

Manor, Bert A., Toledo, Ohio; College of Dentistry, Ohio State University, 1897; died September 7; aged 77.

Martin, George H., Buffalo; died August 28; aged 59.

McKee, Frederick C., Franklin, N. H.; Baltimore College of Dental Surgery, University of Maryland, 1898; died September 6; aged 77.

McVey, Thomas C., Atlantic Highlands, N. J.; School of Dentistry, University of Pennsylvania, 1923; died September 22; aged 51.

O'Hare, Alphonsus P., St. Louis; School of Dentistry, Washington University, 1919; died September 19; aged 58.

Olinger, Harry H., Salem, Ore.; died September 12; aged 72.

O'Reilly, Michael J., Worcester, Mass.; Dental School, Tufts College, 1900; died September 3; aged 73.

Ostermeier, Charles E., New London, Wis.; Dental School, Marquette University, 1932; died September 6; aged 40.

Payne, Norman W., Altoona, Pa.; School of Dentistry, University of Michigan, 1903; died September 4; aged 69.

Pennington, James C., Thomasville, N. C.; School of Dentistry, Medical College of Virginia, 1931; died August 19; aged 42.

Pollard, Charles, Carthage, Mo.; died August 15.

Pountain, John J., Harvard, Ill.; Chicago College of Dental Surgery, 1890; died September 4; aged 84.

Ricks, Ernest J., Chicago; College of Dentistry, University of Iowa, 1919; died September 11; aged 56.

Rosenbaum, Harry L., Jersey City, N. J.; School of Dentistry, University of Pennsylvania, 1910; died September 27.

Roth, Louis M., Prospect, Pa.; died July 10; aged 91.

Rounds, Louie J., Endicott, N. Y.; died June 9; aged 81.

Sadler, Joseph N., Delphos, Ohio; Cincinnati College of Dental Surgery, 1903; died September 3; aged 73.

Sarjeant, Leonard F., New York; College of Dentistry, Howard University, 1912; died September 22; aged 60.

Shaw, William C., Joplin, Mo.; Keokuk Dental College, 1905; died August 10; aged 66.

Shinneman, William A., St. Louis; School of Dentistry, St. Louis University, 1919; died August 31; aged 50.

Shumate, Norman W., Beckley, W. Va.; School of Dentistry, University of Pittsburgh, 1941; died September 3; aged 36.

Stalland, Martin C., St. Paul; Dental School, Northwestern University, 1904; died September 1; aged 77.

Stephens, Charles J., San Francisco; College of Dentistry, University of California, 1898; died September 10; aged 76.

Stout, Henry J., Philadelphia; School of Dentistry, Temple University, 1911; died September 15; aged 62.

Swierczek, August, Chicago; German American Dental College, 1899; died September 16; aged 76.

Tancil, Park, Detroit; College of Dentistry, Howard University, 1911; died August 30; aged 60.

Thompson, James D., Marshall, Texas; Ohio College of Dental Surgery, University of Cincinnati, 1907; died March 13; aged 63.

Truax, Frederick E., Olin, Iowa; College of Dentistry, University of Iowa, 1898; died September 8; aged 74.

Ulmer, William F., New Haven, Conn.; School of Dentistry, Indiana University, 1926; died in September; aged 56.

Walker, Charles, Sextonville, Wis.; Dental School, Northwestern University, 1926; August 14; aged 47.

Warne, J. Russell, Pottsville, Pa.; School of Dentistry, University of Pennsylvania, 1935; died September 5; aged 41.

Webber, Chester H., San Diego, Calif.; School of Dentistry, University of Pennsylvania, 1912; died September 8; aged 62.

Webster, Karl S., Newport, Vt.; Dental School, Tufts College, 1912; died September 11; aged 58.

Wells, Arlo H., Seattle; College of Dentistry, University of Southern California, 1918; died September 9; aged 52.

White, Roy M., Pasadena, Calif.; College of Dentistry, University of Southern California, 1910; died August 12; aged 66.

Willsey, Eugene E., Argos, Ind.; Dental School, Northwestern University, 1897; died September 9; aged 77.

Zuber, Claude E., Birmingham, Ala.; Birmingham Dental College, 1903; died September 5; aged 72.

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ANNOUNCEMENTS

MEETINGS OF STATE SOCIETIES

State	Date	Place	Secretary	Address
Alabama	May 1-3, 1950	Biloxi, Miss.	G. W. Matthews	1922 Tenth Ave., S., Birmingham 5
Arizona			H. G. DeWolf	Valley National Bank Bldg. Tucson
Arkansas	April 2-5, 1950	Little Rock	D. M. Hamm	White Bldg., Clarksville
California	April 24-26, 1950	San Francisco	L. R. Ludwigsen	450 Sutter St., San Francisco
S. California	April 3-5, 1950	Los Angeles	M. E. Ralston	Medico-Dental Bldg., Pomona
Colorado	Oct. 4-7, 1950	Colorado Springs	R. A. Downs	724 Republic Bldg., Denver 2
Connecticut			E. S. Arnold	37 Linnard Rd., W. Hartford
Delaware			Norbert L. Gladnick	1009 Madison St., Wilmington
D. of Columbia			K. H. Wood	202-1835 Eye St., N. W., Washington
Florida			L. M. Schulstad	Professional Bldg., Bradenton
Georgia			J. M. Heard, Jr	Persons Bldg., Macon
Hawaii			J. H. Dawe	P. O. Box 39, Honolulu 10
Idaho	June 26-28, 1950	McCall	A. R. Cutler	Eastman Bldg., Boise
Illinois			P. W. Clopper	623 Jefferson Bldg., Peoria 2
Indiana	May 15-17, 1950	Indianapolis	E. E. Eubank	Kingman
Iowa	May 1-3, 1950	Des Moines	H. I. Wilson	639 Insurance Exchange, Des Moines
Kansas	May 7-10, 1950	Kansas City, Mo.	F. A. Richmond	1008 Huron Bldg. Kansas City
Kentucky	Mar. 29-31, 1950	Louisville	A. B. Coxwell	1976 Douglass Blvd., Louisville
Louisiana	April 14-16, 1950	Monroe	J. S. Bernhard	407 Medical Arts Bldg., Shreveport
Maine			F. P. Gilley	31 Central St., Bangor
Maryland	May 1-3, 1950	Baltimore	E. L. Pessagno, Jr.	415 Medical Arts Bldg., Baltimore 1
Massachusetts	May 1-4, 1950	Boston	A. M. Bommer	349 Broadway, Revere
Michigan	April 24-26, 1950	Detroit	F. Wertheimer	Michigan Dept. of Health, Lansing
Minnesota	Feb. 20-22, 1950	St. Paul	C. V. E. Cassel	242 Lowry Medical Arts Bldg., St. Paul
Mississippi	June 18-21, 1950	Biloxi	F. C. Sneed	Osyka
Missouri	May 7-10, 1950	Kansas City	R. R. Rhoades	201 Merchants Bank Bldg., Jefferson City
Montana	May 4-7, 1950	Helena	C. S. Renouard	304 Phoenix Bldg., Butte
Nebraska	May 8-10, 1950	Omaha	F. A. Pierson	Federal Securities Bldg., Lincoln
Nevada	May 8-9, 1950	Las Vegas	C. A. Paice	Boggs Bldg., Las Vegas
New Hampshire	June 18-20, 1950	Bretton Woods	F. E. Williams	814 Elm St., Manchester
New Jersey	April 26-28, 1950	Atlantic City	J. G. Carr	407 Cooper St., Camden
New Mexico	May 22-24, 1950	Albuquerque	J. S. Eilar	First National Bank Bldg., Albuquerque
New York	June 5-8, 1950	New York	C. A. Wilkie	1 Hanson Place, Brooklyn
North Carolina	May 18-20, 1950	Pinehurst	R. F. Hunt	Rose Drug Co., Bldg., Rocky Mount
North Dakota	May 7-10, 1950	Fargo	A. L. Smeby	Northwood
Ohio			E. G. Jones	185 E. State St., Columbus
Oklahoma	April 16-19, 1950	Tulsa	F. H. Binkley	Hennessey
Oregon	Mar. 6-8, 1950	Portland	H. C. Fixott, Jr.	Medical Dental Bldg., Portland
Panama Canal Zone			R. O. Leon	Box 1094, Ancon
Pennsylvania			J. Wittek	217 State St., Harrisburg
Puerto Rico			F. Guerra	Avenida Ponce de Leon, Santurce
Rhode Island	Jan. 17-18, 1950	Providence	J. F. Colgan	838 Newport Ave., Pawtucket
South Carolina	May 7-9, 1950	Columbia	J. R. Owings	201 E. North St., Greenville
South Dakota	May 14-16, 1950	Huron	E. W. Elmen	Sioux Falls
Tennessee	May 10-12, 1950	Chattanooga	E. J. Justis	Exchange Bldg., Memphis
Texas	April 23-27, 1950	Dallas	W. Ogle	310 N. Ervay St., Dallas
Utah			B. F. McBride	Medical Arts Bldg., Salt Lake City
Vermont	May 22-24, 1950	Woodstock	J. A. Larrow	Middlebury
Virginia	April 17-19, 1950	Roanoke	J. E. John	804 Medical Arts Bldg., Roanoke
Washington	May 22-24, 1950	Spokane	F. J. Dingler	1502 Medical-Dental Bldg., Seattle 1
West Virginia	May 15-17, 1950	Huntington	A. B. Drake	Huntington
Wisconsin	April 11-13, 1950	Milwaukee	R. A. Mason	964 N. 27th St., Milwaukee
Wyoming			T. A. Ward	Casper

OTHER MEETINGS

Name	Date	City	Secy. or Chm.	Address
Academy of Denture Prosthetics	May 1-7, 1950	Milwaukee	I. L. Furnas Secy.	La Jolla, Calif.
American Academy of Dental Medicine, Annual Mid-Winter Meeting	Dec. 4	New York	W. M. Greenhut Secy.	124 E. 84th St., New York 28
American Association for the Advancement of Science, Subsection on Dentistry	Dec. 30	New York	F. Krasnow	422 E. 72nd St., New York 21
American Board of Orthodontics	May 4-7, 1950	Chicago	S. C. Hopkins Secy.	1726 Eye St., N. W., Washington, D. C.
American Board of Prosthodontics	Jan. 29-Feb. 4, 1950*		I. R. Hardy Secy.	Tufts Dental College, 136 Harrison Ave., Boston
Chicago Dental Society Midwinter Meeting	Feb. 6-9, 1950	Chicago	E. W. Baumann Secy.	30 N. Michigan Ave. Chicago
Greater New York Dental Meeting Twenty-Fifth Anniversary	Dec. 5-9	New York	H. S. Horton Chm. Press & Publication	Rm. 106A, Hotel Statler, New York 1
National Board of Dental Examiners	Dec. 5-6†		G. L. Teall Secy.	Box 71, Haiwatha, Kan.
New York University College of Dentistry, Silver Anniversary	April 14, 1950	New York	Sidney Sorrin Chm.	New York University Alumni Office 22 Washington Square, North, New York 11
Pan American Odontological Association, Thirteenth Annual Dinner-Meeting	Dec. 7	New York	R. H. Brodsky Exec. Secy.	14 E. 81st St., New York
Rocky Mountain Midwinter Dental Meeting	Jan. 8-11, 1950	Denver	G. H. Sierama Secy.	724 Republic Bldg., Denver 2
Sigma Epsilon Delta Fraternity, Annual Dinner	Dec. 7	New York	A. L. Ungar Chm.	211 Central Park West, New York 24
Southwestern Society of Orthodontists	Feb. 12-15, 1950	Houston, Tex.	M. A. Flesher Secy.	Medical Arts Bldg., Oklahoma City
Temple Dental Alumni, Annual Meeting	May 9, 10, 1950	Philadelphia	A. L. Borish	255 S. 17th St., Philadelphia 3
Thomas P. Hinman Mid-Winter Clinic, Thirty-Eighth Annual Meeting	Mar. 19-22, 1950	Atlanta, Ga.	S. L. Davis Gen. Chm.	932 Candler Bldg., Atlanta, Ga.
University of Kansas City, School of Dentistry, Kansas City-Western Dental College, Alumni Annual Meeting	Mar. 20, 21, 1950	Kansas City, Mo.	H. H. Dukes Chm. Publicity Committee	New Brotherhood Bldg., Kansas City, Kan.
University of Toronto, Faculty of Dentistry, Continuation Course for Graduates in Endodontia	Dec. 5-9	Toronto	R. G. Ellis Dean	230 College St., Toronto 2-b, Canada

*Examinations for certification.

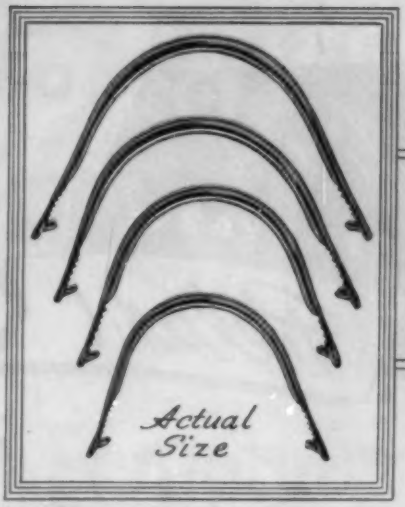
†Examinations (Part I and Part II) will be held in schools where there are five or more candidates.

MEETINGS OF STATE BOARDS OF DENTAL EXAMINERS

State	Date	Place	Secretary	Address
California	Jan. 30, 1950 June 19, 1950 July 24, 1950	San Francisco Los Angeles San Francisco	K. I. Nesbitt	507 Polk St., San Francisco 2
Hawaii	Feb., Aug.*	Honolulu	H. L. Houvener	7-8 Pantheon Bldg., Honolulu
Iowa	June 5-9, 1950	Iowa City	H. M. Willits	719 Rosbek Bldg., Dubuque

State	Date	Place	Secretary	Address
Michigan	Jan. 29-Feb. 4, 1950 June 11-June 17, 1950	Ann Arbor	J. L. Champagne	3714 W. McNichols Road, Detroit 21
Minnesota	Jan. 9-14, 1950	Minneapolis	F. A. Larson	1632 Washington St., N. E. Minneapolis
New Jersey	Dec. 12-16† Dec. 12-13‡ June 5-9, 1950† June 5-6, 1950‡		W. A. Wilson	150 E. State St., Trenton 8
Pennsylvania	Dec. 12-17† Dec. 12-14‡	Philadelphia	R. E. V. Miller	Northampton National Bank Bldg., Easton
Rhode Island	Dec. 6-7	Providence	F. M. Hackett	State Office Bldg., Divn. Professional Regulation, Providence

*Dentistry and dental hygiene.
†Dentistry.
‡Dental Hygiene.



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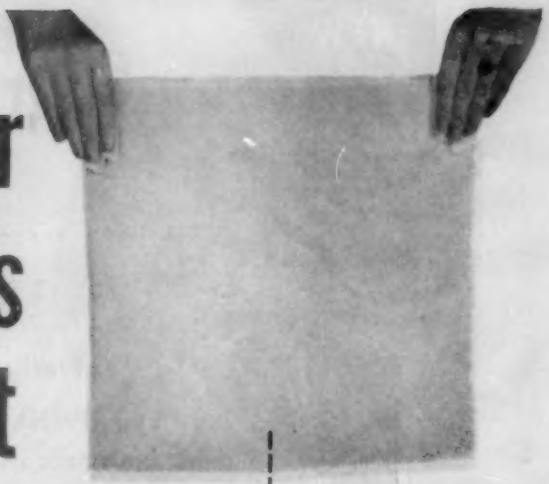

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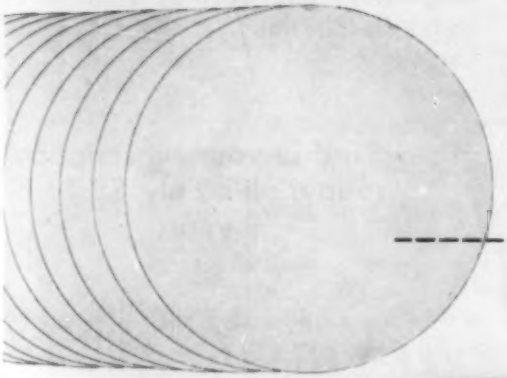

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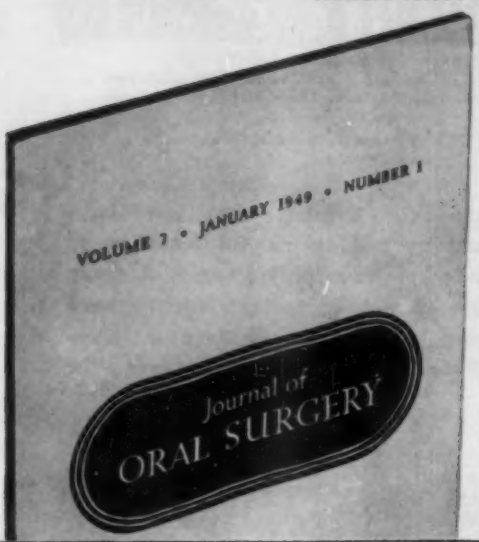

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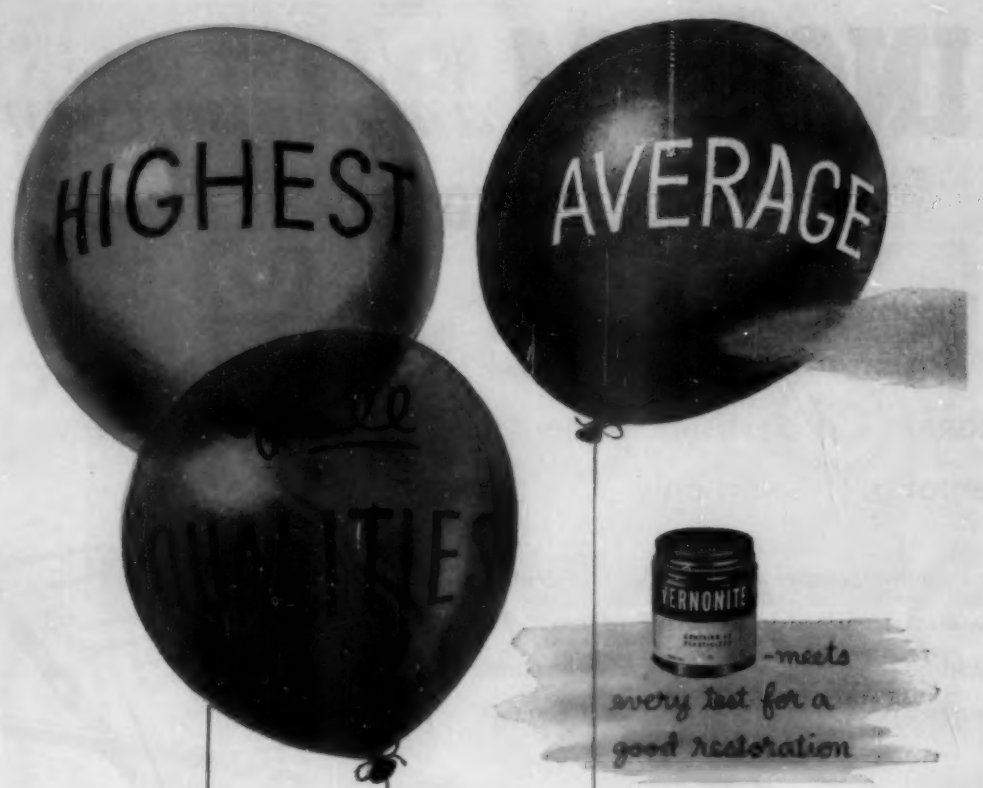

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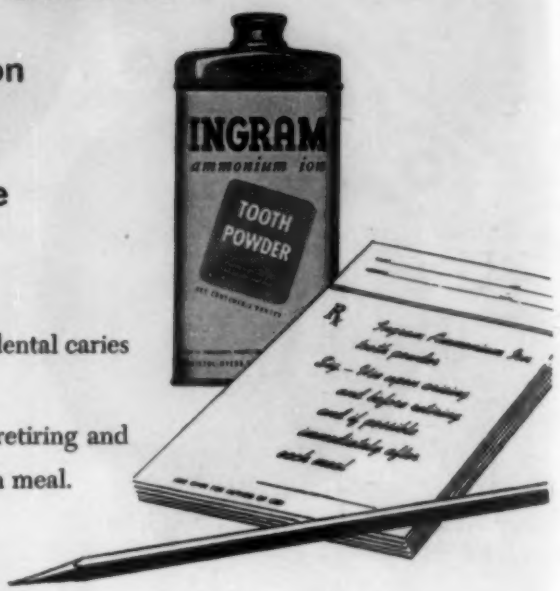

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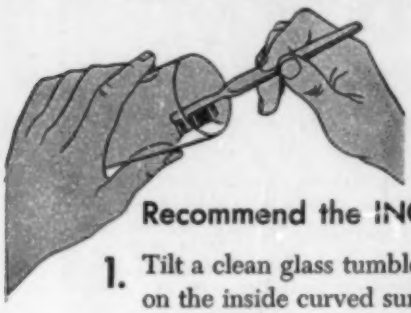

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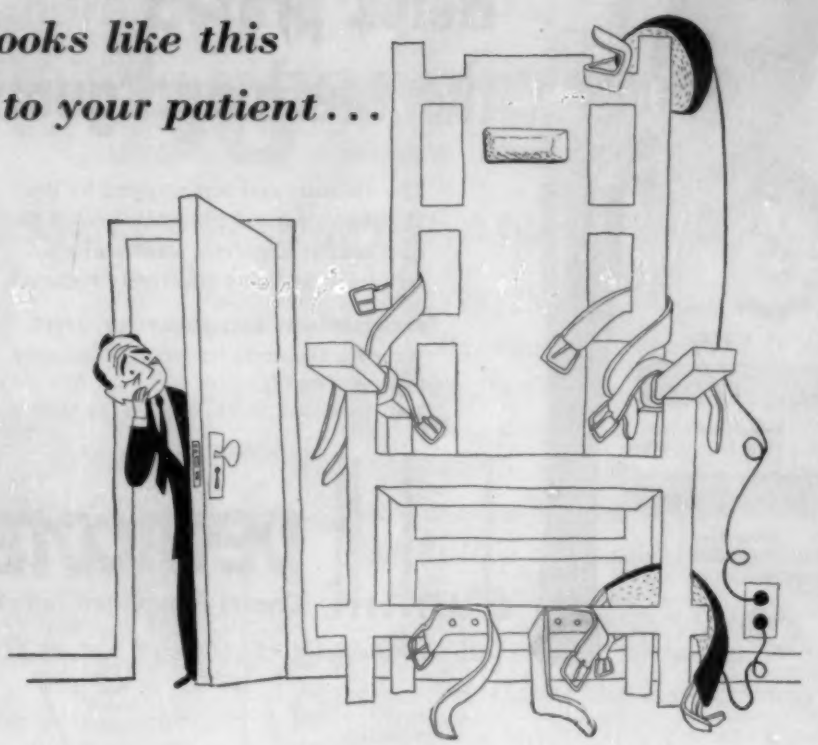
If your chair looks like this to your patient . . .

★ *Give now to the A.D.A. Relief Fund*



. . . you can allay his apprehension by administering Nembutal half an hour before his appointment. Then he will relax and make operative procedures easier for you both. Nembutal is a short-acting sedative with a wide margin of clinical safety. It is prepared in many dosage forms—all available through your usual source of supply. Why not try them on some of your difficult patients? For literature, write AbbottLaboratories,NorthChicago,Ill.

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Nembutal Sodium Capsules, in 30-mg. (½-gr.), 50-mg. (¾-gr.), and 0.1-Gm. (1½-gr.) sizes enable you to adjust the dose to the patient and the need. **Nembutal Elixir,** representing 0.12 Gm. (2 grs.) of Nembutal Sodium per fluid-ounce, is a palatable syrup appreciated by children and adults who dislike capsules. **Nembutal and Aspirin Capsules,** representing Nembutal Sodium 30 mg. (½ gr.) and aspirin 0.3 Gm. (5 grs.), combine sedative and analgesic qualities, thus aiding in the control of postoperative pain and mental distress. For other forms, see literature offered above.

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Before Use:
Crystal Filter is pure white

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Filter turns dark as it traps nicotine and tars

Helps protect the teeth and gums!

The nicotine and tars trapped by the Denicotea crystal filter *can't reach* the oral cavity. Cigarette stain and gum irritation are thus effectively reduced.

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Write for Denicotea holder, $1.00 postpaid, *(regular price $2).*
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higher blood salicylate levels more quickly with

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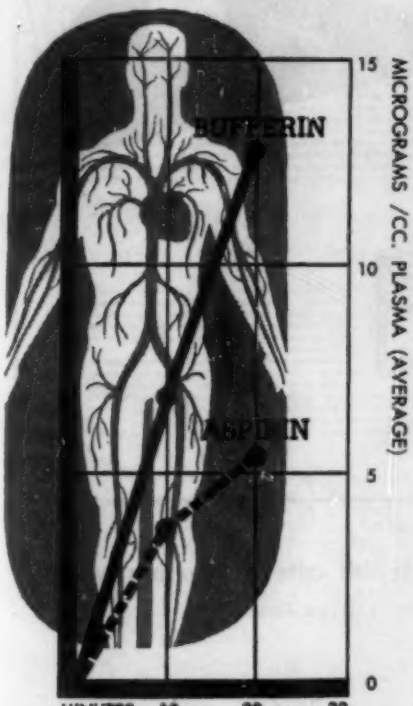
ASSURES PROMPTER ANALGESIC ACTION



COMPARISON OF BLOOD SALICYLATE LEVELS AFTER INGESTION OF ASPIRIN AND BUFFERIN

It is BUFFERIN's speedier absorption into the blood stream which promotes its more rapid analgesic action. Within 10 minutes after its ingestion the blood salicylate levels are as great as those attained by aspirin in twice this time. In 20 minutes BUFFERIN's blood salicylate levels are double its 10 minute levels.

BUFFERIN is better tolerated—an added advantage. Gastric distress—sometimes found when aspirin is taken—is almost unknown when BUFFERIN is the analgesic used; for, in addition to its 5 grains of acetylsalicylic acid, it provides optimal proportions of the antacids magnesium carbonate and aluminum glycinate.

Patients appreciate the **"faster pain relief with better gastric tolerance"** which BUFFERIN provides.

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BUFFERIN is available in vials of 12 and 36 tablets and in bottles of 100.

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BUFFERIN IS A TRADE-MARK OF THE BRISTOL-MYERS COMPANY

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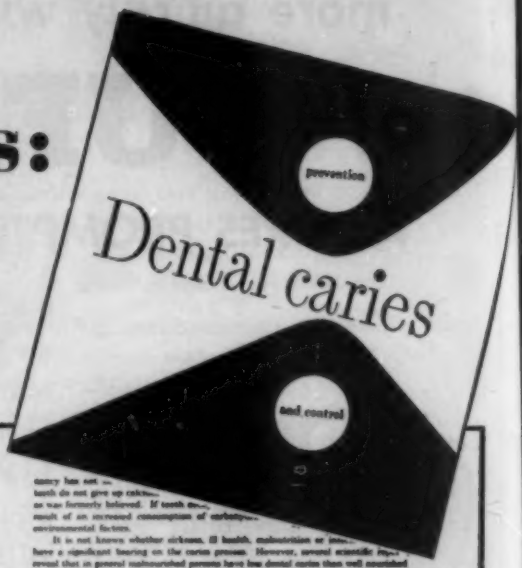
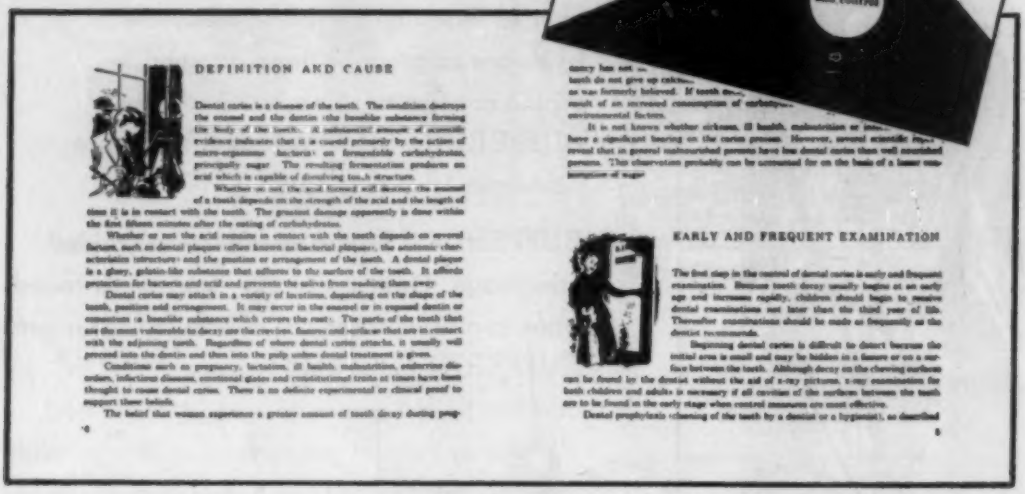
ANNOUNCING THE PUBLICATION OF

Dental Caries:

PREVENTION AND CONTROL





DEFINITION AND CAUSE

Dental caries is a disease of the tooth. The condition destroys the enamel and the dentin (the bonelike substance forming the body of the tooth). A substantial amount of scientific evidence indicates that it is caused primarily by the action of micro-organisms (bacteria) on fermentable carbohydrates, principally sugar. The resulting fermentation produces an acid which is capable of dissolving tooth structure.

Whether or not the acid formed will destroy the enamel of a tooth depends on the strength of the acid and the length of time it is in contact with the tooth. The greatest damage apparently is done within the first fifteen minutes after the eating of carbohydrates.

Whether or not the acid remains in contact with the teeth depends on several factors, such as dental plaques (often known as bacterial plaques), the anatomic characteristics (structure) and the position or arrangement of the teeth. A dental plaque is a gluey, gelatin-like substance that adheres to the surface of the tooth. It affords protection for bacteria and acid and prevents the saliva from washing them away.

Dental caries may attack in a variety of locations, depending on the shape of the tooth, position and arrangement. It may occur in the enamel or in exposed dentin or cementum (a bonelike substance which covers the root). The parts of the teeth that are the most vulnerable to decay are the crevices, fissures and surfaces that are in contact with the adjoining teeth. Regardless of where dental caries attacks, it usually will proceed into the dentin and then into the pulp unless dental treatment is given.

Conditions such as pregnancy, lactation, ill health, malnutrition, endocrine disorders, infectious diseases, emotional states and constitutional traits at times have been thought to cause dental caries. There is no definite experimental or clinical proof to support these beliefs.

The belief that women experience a greater amount of tooth decay during preg-

4

[illegible] has not ...
tooth do not give up calcium ...
as was formerly believed. If teeth de...
result of an increased consumption of carbohydr...
environmental factors.

It is not known whether sickness, ill health, malnutrition or [illegible] have a significant bearing on the caries process. However, several scientific [illegible] reveal that in general malnourished persons have less dental caries than well nourished persons. This observation probably can be accounted for on the basis of a lesser consumption of sugar.

EARLY AND FREQUENT EXAMINATION

The first step in the control of dental caries is early and frequent examination. Because tooth decay usually begins at an early age and increases rapidly, children should begin to receive dental examinations not later than the third year of life. Thereafter examinations should be made as frequently as the dentist recommends.

Beginning dental caries is difficult to detect because the initial area is small and may be hidden in a fissure or on a surface between the teeth. Although decay on the chewing surfaces can be found by the dentist without the aid of x-ray pictures, x-ray examination for both children and adults is necessary if all cavities of the surfaces between the teeth are to be found in the early stage when control measures are most effective.

Dental prophylaxis (cleaning of the teeth by a dentist or a hygienist), as described

5

Produced by the Council on Dental Health after consulting with recognized authorities in dental caries research.

PRICES:

25 copies	$2.20
50 copies	3.70
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A sample copy on request

AMERICAN DENTAL ASSOCIATION

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Anterior bridge restorations placed in the mouth immediately after extraction spare the patient many days of embarrassment.

The only tooth completely suited to these immediate extraction cases is the Trupontic tooth. And this is but one of *many* advantages of Trupontics. Unsurpassed esthetics is another advantage—now that Steele's Trupontics are available in New Hue shades.

Perhaps more of your anterior restorations could well utilize the advantages inherent in Trupontics, Doctor!

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NOTE: Where Steele's New Hue Trupontics replace anterior teeth, Steele's GOLD FACED backings should be used; they preserve the original shades of the New Hue teeth.

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"See your dentist twice a year"

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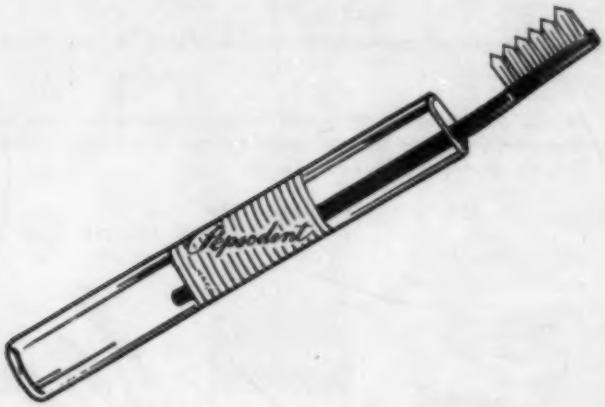

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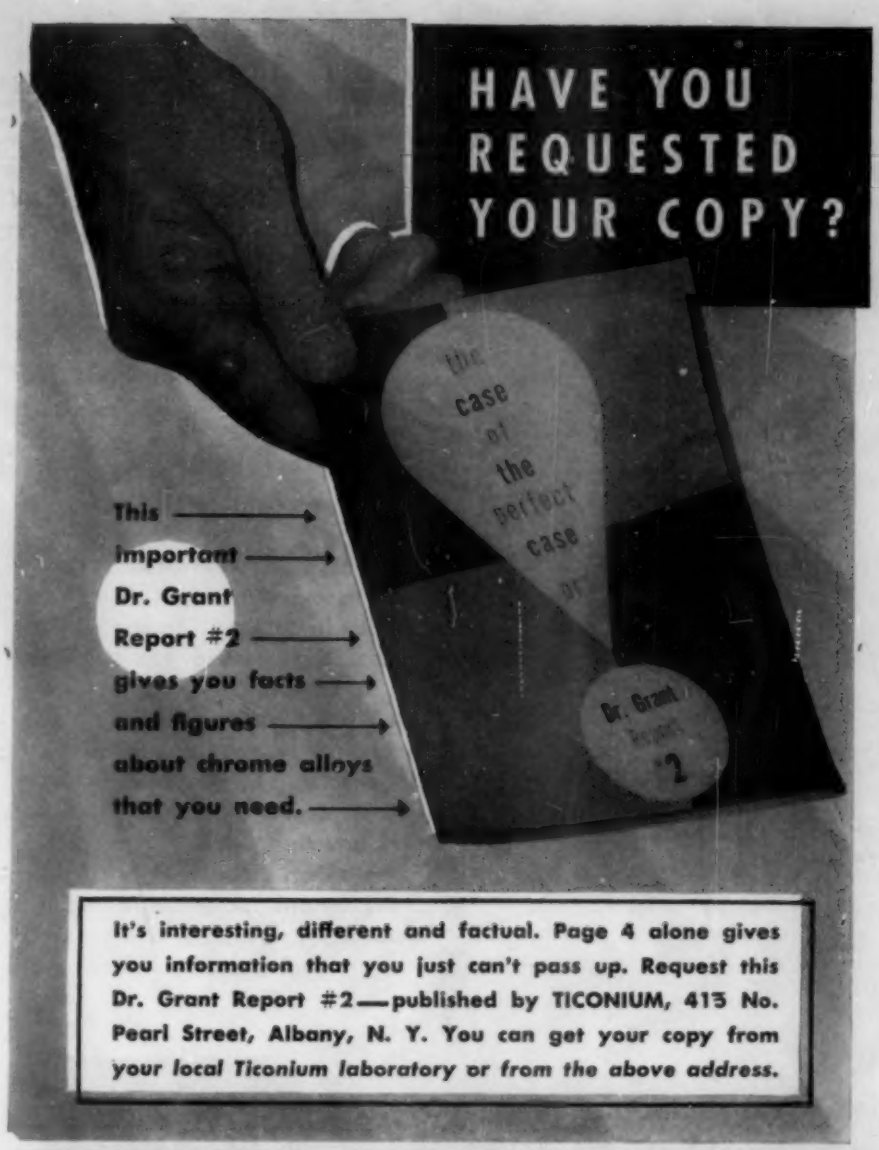

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AN IDENTICAL REPRODUCTION

OF PATIENT'S NATURAL DENTITION

Fig. 1

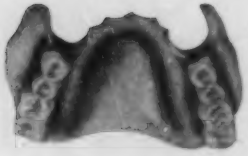

Fig. 2

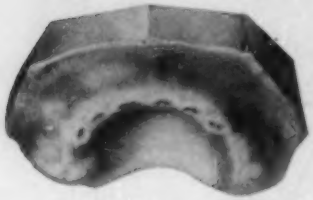

Fig. 3

Fig. 4

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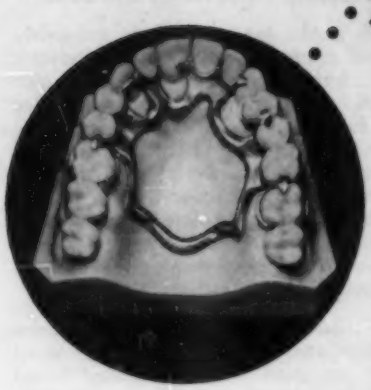

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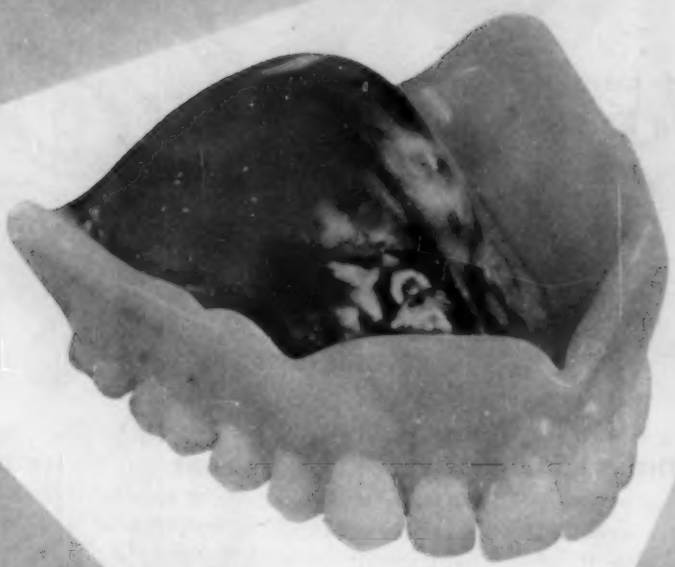

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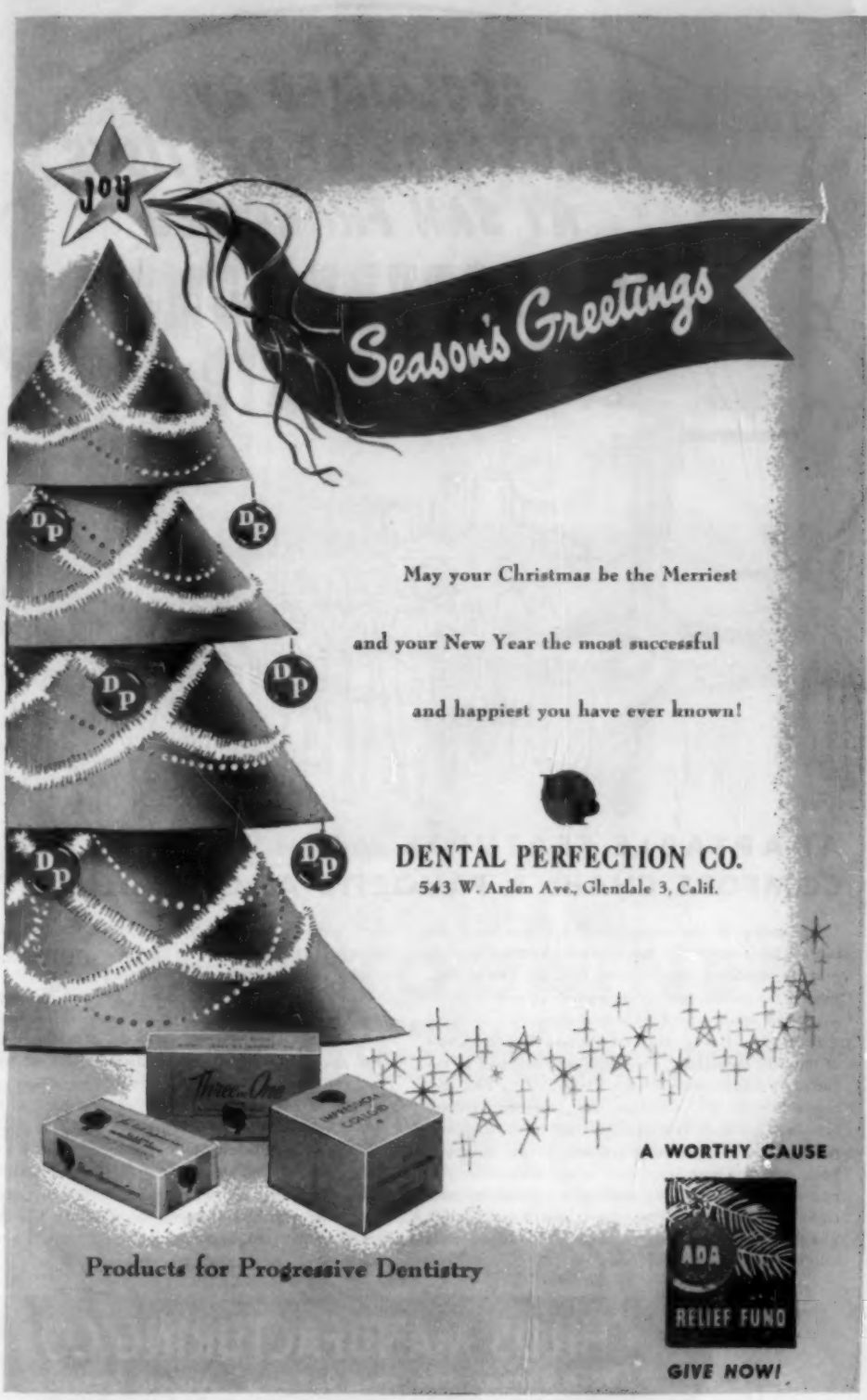
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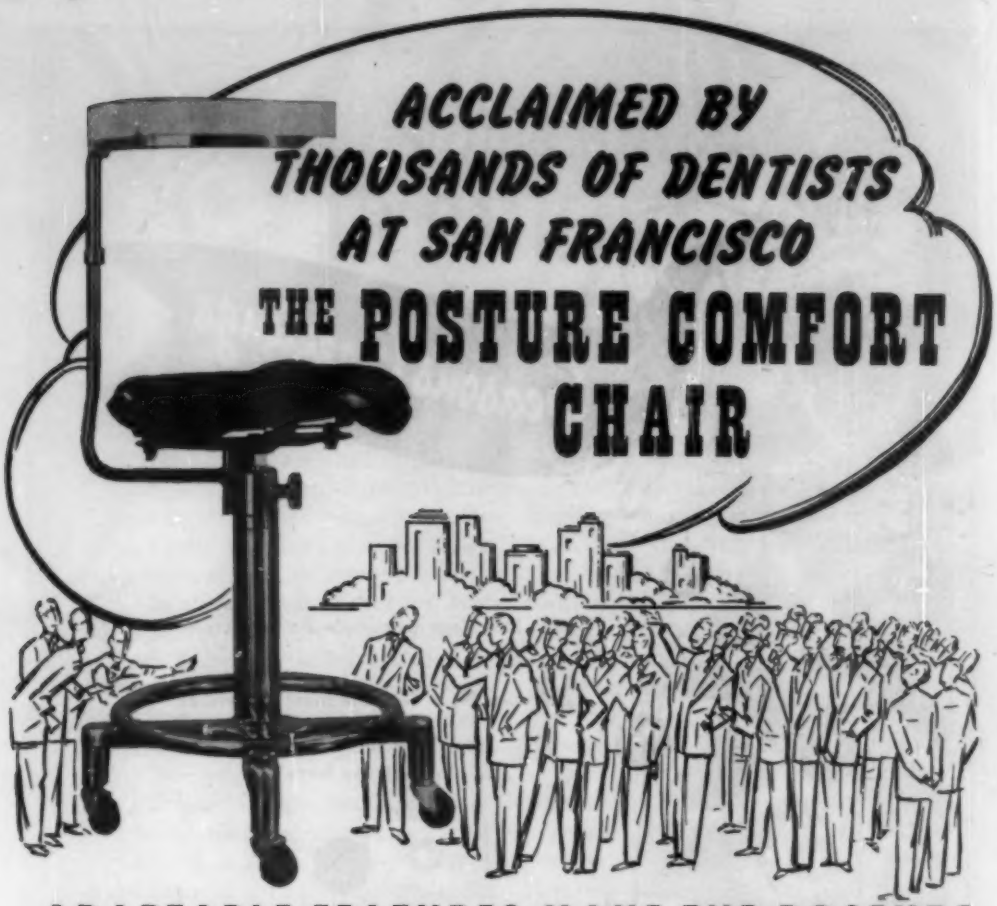

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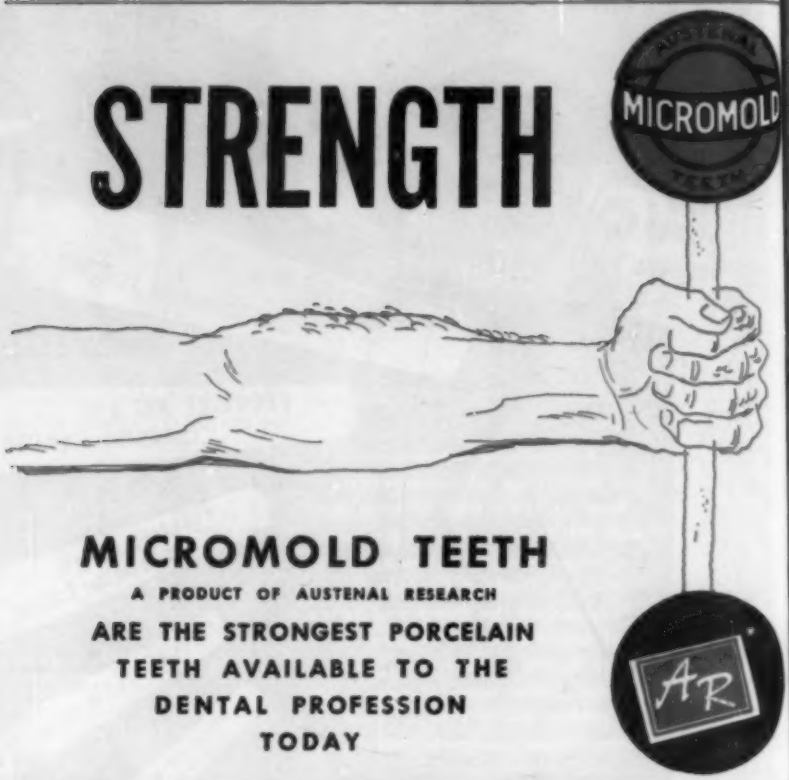

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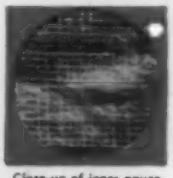

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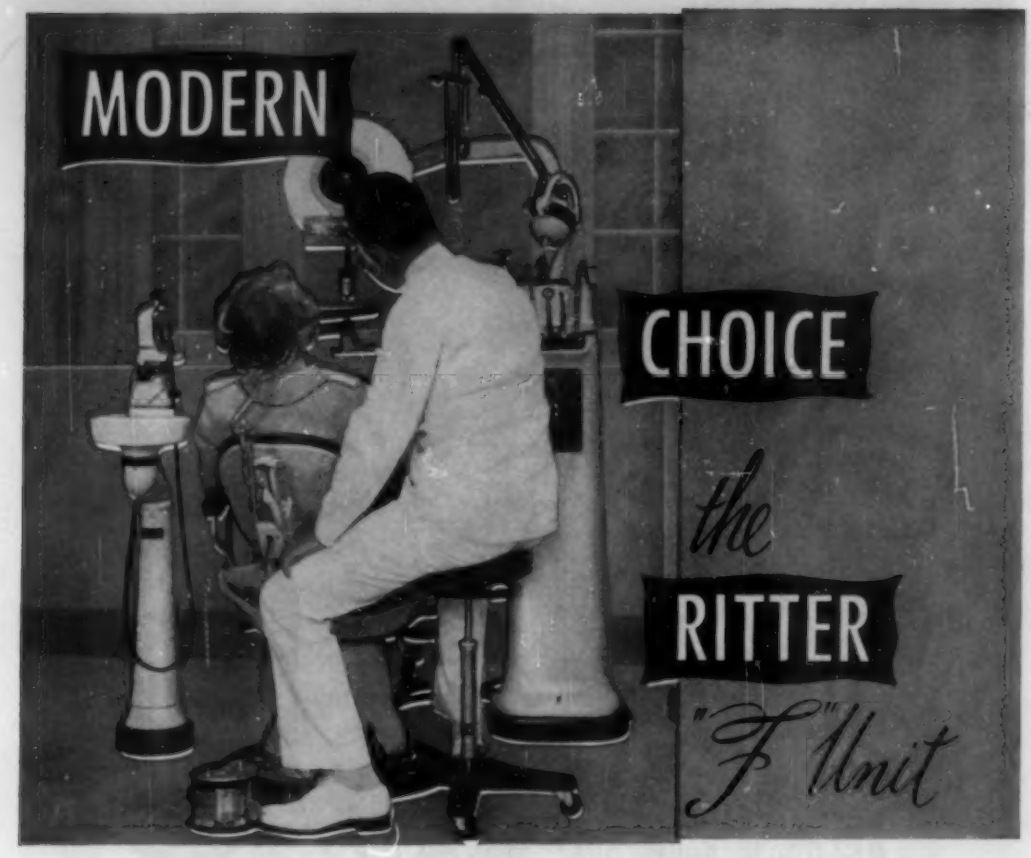

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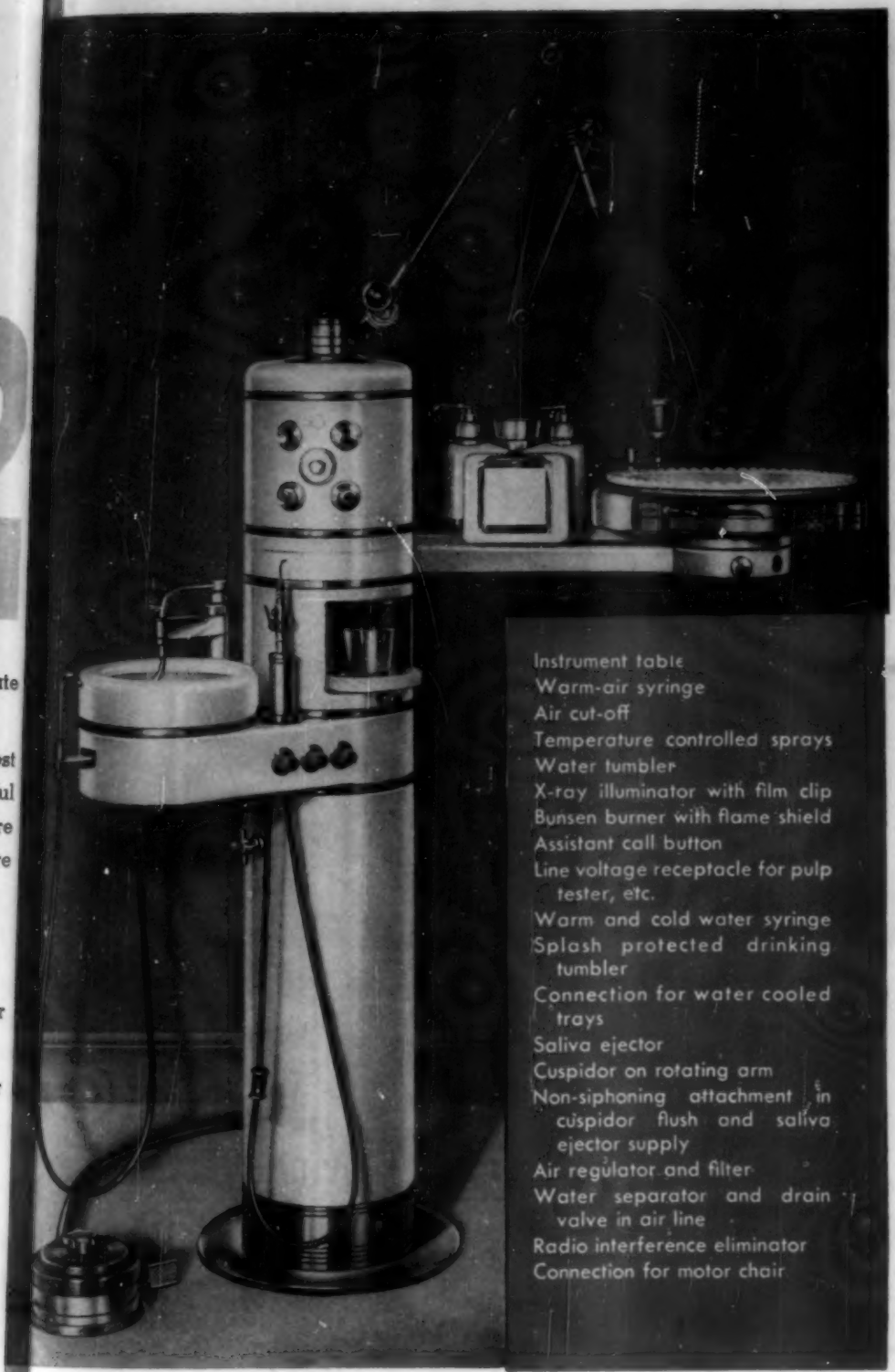

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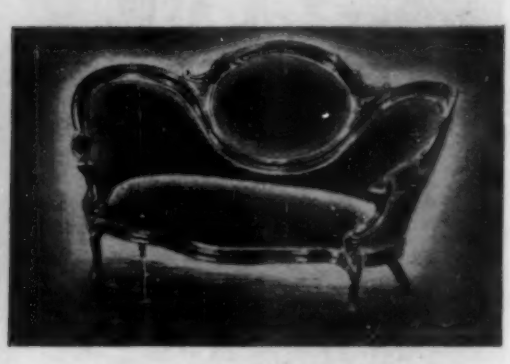

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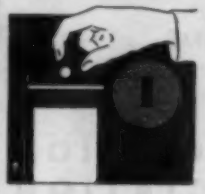

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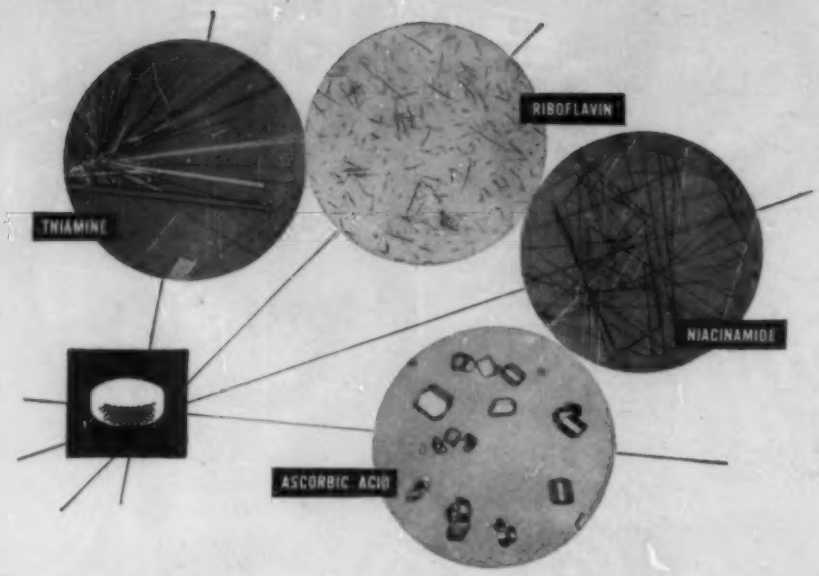

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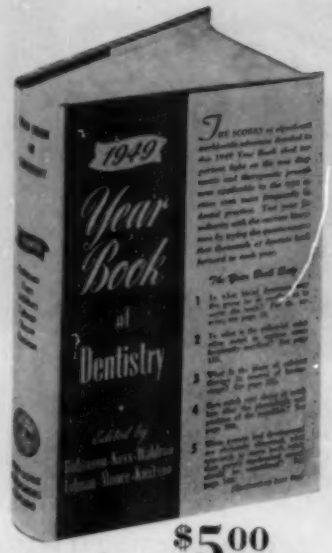

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MISCELLANEOUS

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AGENCIES

OPPORTUNITIES AVAILABLE

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(e) Young dentist capable of treatment planning in dental problems; diagnostic department, university school. Burneice Larson, Medical Bureau, Palmolive Building, Chicago.

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(f) Associate or assistant professor in orthodontia, instructor or assistant professor in operative dentistry, instructor in dental medicine and oral pathology. Burneice Larson, Medical Bureau, Palmolive Building, Chicago.

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(h) Assistant by dentist, established forty years; eastern university center; partnership; opportunity inheriting practice. Burneice Larson, Medical Bureau, Palmolive Building, Chicago.

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(i) Dentist to practice with children enrolled in public schools, university town; Southeast. Burneice Larson, Medical Bureau, Palmolive Building, Chicago.

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(j) Orthodontist to become associated with eight-man clinic operating own hospital; East. Burneice Larson, Medical Bureau, Palmolive Building, Chicago.

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(d) Hygienist; dental group well established in California. Burneice Larson, Medical Bureau, Palmolive Building, Chicago.

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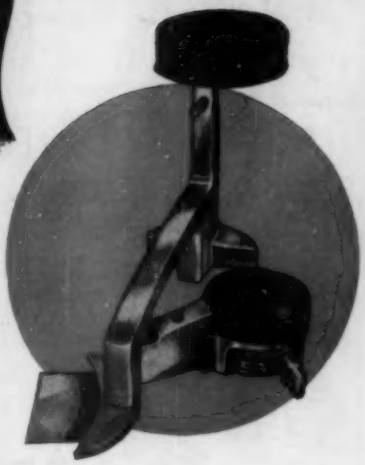

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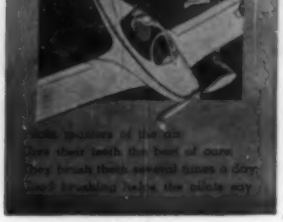

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